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ABSTRACT

In March 1988, the Office of the Legislative Auditor for the State of Minnesota conducted a program evaluation and financial audit of physical plant operations at the University of Minnesota's Twin Cities campus. The auditors examined the physical plant's management, financial, and personnel controls and the effectiveness and efficiency of maintenance, repair, and custodial operations. This document comprises the resulting report to the Legislative Audit Commission. After an executive summary and an introduction, the report consists of six chapters: (1) background, including organization, staffing, and general financial information; (2) financial management, including funding and budgetary philosophy, operating budget, rates charged for services, and other financial concerns; (3) overall measures of organizational effectiveness, including department organization, internal communication, employee satisfaction, external relationships, achievement of objectives, and recommendations; (4) productivity and cost-effectiveness of shops, including scheduling, staffing and work rules, preventive maintenance, transportation, work quality, and recommendations; (5) custodial and grounds maintenance operations; and (6) related issues, including the used equipment purchase program, special personnel issues, and remodeling. Appended are results of a survey of physical plant employees and samples of work reviewed by technical consultants. Numerous tables and figures are included. (TE)

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ED304792

University of Minnesota Physical Plant Operations

August 1988

Office of the Legislative Auditor
State of Minnesota

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University of Minnesota Physical Plant Operations

August 1988

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JAMES R. NOBLES, LEGISLATIVE AUDITOR

August 25, 1988

Representative Phillip J. Riveness, Chairman
Legislative Audit Commission

Dear Representative Riveness:

In March 1988 the Legislative Audit Commission directed our office to do a program evaluation and financial audit of Physical Plant Operations at the University of Minnesota's Twin Cities campus. We have completed our assignment and are transmitting our report to the commission.

We examined Physical Plant's management, financial and personnel controls, and the effectiveness and efficiency of maintenance, repair, and custodial operations. Our report recommends many changes, particularly in Physical Plant's maintenance and repair activities. We also call on University administrators and the Board of Regents to forge a more open and constructive relationship on Physical Plant issues.

Our study was managed by Joel Alter, Allan Baumgarten, and Claudia Gudvangen. They were assisted by Kari Bergum, David Chein, Al Finlayson, Mary Guerriero, Joan Haskin, Connie Keeler, Lori Pellicci, and Jim Riebe. We also employed three consulting firms to provide technical assessments, and we received valuable advice and help from the University of Minnesota's Survey Research Center.

We wish to thank the many University officials, Regents, and employees who contributed to our study. Everyone we approached was completely cooperative.

Sincerely yours,

James R. Nobles
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EXECUTIVE SUMMARY

Physical Plant Operations provides important support services at the University of Minnesota Twin Cities campus. Its nearly 1,400 employees are responsible for maintaining 12 million square feet of buildings and 500 acres of grounds. The department spends approximately $75 million annually.

In February 1988, the Legislative Audit Commission directed the Legislative Auditor to conduct a financial audit and program evaluation of Physical Plant. In our study, we asked:

- Has Physical Plant established and implemented appropriate practices for budgeting and for managing its spending, revenues, and personnel?
- Is Physical Plant Operations effectively managed? Does it have the characteristics of well-managed organizations?
- How productive are employees in the maintenance shops and Custodial and Grounds Division? Is their work planned and supervised effectively? How do work rules and the terms of collective bargaining agreements affect productivity?

We found that Physical Plant lacks adequate financial controls and good management systems in several important aspects of its operation. These deficiencies are the result of years of neglect. Physical Plant management and University administrators acknowledge the problems and have developed plans to address them, but progress so far has been limited.

We are particularly concerned about problems in the operation of the maintenance shops. The cost of the shops' work is higher than that of comparable organizations, mainly because of higher wages and greater use of specialists. Although the work appears to be of high quality, productivity and cost-effectiveness could be significantly improved. On the other hand, our assessment of Physical Plant's custodial operation is generally positive.

We make recommendations to strengthen the overall management of Physical Plant and create a more efficient operation. We emphasize, however, that progress will continue to be difficult unless communication is improved between management and workers, and management and the Board of Regents. It is particularly important that the Board of Regents and University administration establish more constructive communications on Physical Plant issues and gain greater agreement on policies and direction. We commend this report to them as a starting point. It offers criticisms that we think are constructive and

suggestions that could be helpful. We hope the report will receive serious consideration.

A. FINANCIAL MANAGEMENT

1. Funding and Budget Philosophy

Overall, about one-third of Physical Plant's total costs have been charged to the budgets of other University departments, and nearly two-thirds to its own operating budget. For repair and maintenance work, however, an even larger share of costs is charged to the budgets of other University departments, presumably to complete nonroutine projects. We found that:

- There is no definitive policy for distinguishing routine services, which are to be charged to the Physical Plant operating budget, from nonroutine services, which are to be charged to other departments.

Thus, University departments may be subject to uncertainty and inconsistent treatment.

2. The Physical Plant Operating Budget

Physical Plant follows established University budget principles when developing its annual operating budget. We identified two budget issues that the University needs to address: deferred maintenance and fuel and utility costs. Deferred maintenance consists of most of the University's large repair and maintenance activities. Physical Plant has identified a backlog of about $13 million in deferred maintenance activities. However, there has never been a comprehensive review of University building conditions, nor a plan for addressing identified problems. This constitutes a serious weakness in the University's budget process. To address its maintenance problems, the University obtained $8 million from the Legislature for the 1987-89 biennium. We are concerned, however, that:

- Physical Plant did not fully consider its own available financial resources before seeking legislative support for deferred maintenance.

In 1987, $1.2 million was transferred from repair and maintenance accounts to Physical Plant administrative accounts for other uses, and over $3 million remained unspent in Physical Plant repair and maintenance accounts. Most unspent funds were shown as Physical Plant encumbrances. However, we believe Physical Plant encumbrances often do not reflect realistic demands on current funds. For example, in 1987 Physical Plant identified nearly $400,000 of encumbrances for which work had not been initiated.

A second budget issue is fuel and utility costs, which vary considerably from one year to the next. We found that:

- The Physical Plant operating budget is not effectively controlled because of the volatility of fuel and utility costs.

In past years, Physical Plant often received supplemental budget amounts to finance fuel and utility deficits. Conversely, mild winters may produce unexpected benefits for Physical Plant, since it could use unspent fuel and utility funds for other purposes.

This could not happen if the fuel and utility budget was separate from Physical Plant's operating budget.

3. Rates Charged for Services

The amounts Physical Plant charges to other departments should reflect current and actual costs and should be applied equitably. We found that:

- Rates charged for services are often unsupported by current accounting records, are sometimes inequitable, and are not monitored or authorized by the University central administration.

In some cases, Physical Plant does not recover its actual cost, while in other cases it is overcharging certain groups of customers. For example, a surcharge is added to trade worker wages to recover the cost of drivers, but this charge is not added to civil service worker wages who also use the drivers' services. Similarly, administrative costs are not recovered in charges to many University buildings.

Since 1981, Augsburg College and Fairview and St. Mary's Hospitals have purchased steam heat from Physical Plant. Currently, they are charged the rate paid by University departments during the previous six months. For the period from July 1985 to June 1988, we found:

- Physical Plant could have collected an additional $262,000 if it had charged these users the same rate charged to University departments.

Because the Legislature was providing special funding for the University's fuel and utility deficits before 1984, it was unintentionally subsidizing outside users of the University heating system.

We also examined Physical Plant's inventory pricing methods, which we found to be inconsistent and sometimes arbitrary. Due to certain mark-up practices, we found that:

- Physical Plant has accumulated approximately $261,000 of excess funds beyond its inventory costs.

These excess funds remain in inventory accounts, but could be transferred out for other uses.

4. Other Financial Concerns

We reviewed various payroll and personnel controls at the Physical Plant. The Associate Provost for Physical Plant is also the Associate Vice President for the University's Personnel Department. We concluded that:

- This arrangement could compromise the objectivity that a personnel department needs in working with operating units.

We believe the University needs to revise its organizational structure to provide an independent review of Physical Plant's personnel transactions.

We reviewed controls over $1.6 million dollars of inventory which Physical Plant maintains for repair parts, materials and custodial supplies. We found that:

- There are inadequate records and poor security practices for items in inventory.

For example, we found that inventory practices differ significantly between Physical Plant's various shops and divisions, and there are too many people with unrestricted access to inventory items.

Our review of purchasing practices revealed that:

- Purchases have been approved by persons without the proper authority or appropriate knowledge.

The weaknesses in purchasing practices may allow unnecessary purchases to occur. We also found poor controls for receiving purchased items and retaining the proper documentation.

Finally, we observed that:

- Physical Plant financial information is incomplete and does not provide an adequate basis for management decision making.

Physical Plant could benefit immensely by having comprehensive, accurate, and timely financial information on the operations of its divisions. Physical Plant activities cost approximately $75 million per year. However, Physical Plant managers only receive financial information on about $50 million of the costs. Useful financial information is not generated for Physical Plant on the remaining costs, which are basically charged to budgets of other University departments. In addition, the allocation methods used for payroll costs impede Physical Plant from obtaining comprehensive financial information on its work force.

B. OVERALL MANAGEMENT

Since the current top managers of Physical Plant assumed their duties in 1986, they have taken a number of important steps to diagnose problems and remedy them. To their credit, they have emphasized setting overall objectives for the department as well as its operating divisions, and they have tracked their progress toward those objectives. Nonetheless, we observed several problems with the organization and management of Physical Plant.

1. Organization

In 1986, Physical Plant was separated from the University's Physical Planning Department, which has responsibility for planning and management of new University buildings. Physical Plant now reports to the Vice President of Academic Affairs, who is also the Provost (chief operating officer) of the Twin Cities campus. Given the Provost's already wide span of authority and orientation toward academic matters, this arrangement does not provide for effective oversight of Physical Plant by the University's central administration. Furthermore, the organizational gap between Physical Plant and Physical Planning seems to parallel a gap in the working relationship of these two departments.

Within Physical Plant, we found:

- Recent reorganizations of the department have been poorly communicated to managers and staff, and have not been particularly effective.

From our interviews, it was clear that managers and staff had little opportunity to comment on proposed organizational changes, and that the effect of these changes has not been communicated well to them. For example, two division managers told us that, four months after the last major change, they still had not been fully informed of the scope of their authority and responsibilities.

The current organization has nine divisions headed by an assistant or associate director. These divisions vary widely in size: the Custodial and Grounds Division employs more than 600 workers while the Environmental Operations and Engineering Divisions are less than one-tenth that size. In our view, the current organization of Physical Plant is awkward and makes effective management difficult. In particular, dividing the maintenance and operations functions into five separate divisions means that there are too many division heads reporting to the director.

In 1987, the department sought to improve management of the maintenance shops by adding seven new area managers, each of whom would supervise a cluster of shops. Some Regents opposed the plan, but it was eventually approved. A companion proposal for nine work planners and schedulers was not approved. Unfortunately, we found:

- The new area managers have not been well used and have not received adequate support and guidance from their managers.

2. Employee Job Satisfaction and Morale

We administered a standardized job satisfaction questionnaire to custodians and maintenance shops workers. The results show that job satisfaction among Physical Plant workers is somewhat lower than norms for maintenance and janitorial workers. There seem to be particular morale problems in Physical Plant's shops, where about 70 percent of workers believe the organization is becoming a less satisfying place to work.

Perhaps the clearest findings from the survey showed that:

- Employees have serious concerns about Physical Plant management and supervision.

Most employees were dissatisfied with the way Physical Plant policies are put into practice. Also, both custodians and shops workers expressed concerns about the direction and feedback they receive from their direct supervisors as well as the general quality of supervision.

3. Communication With the Board of Regents

The relationship between Physical Plant's managers and the University's Board of Regents is a source of dissatisfaction and frustration on both sides. Several Regents told us that the information they receive from Physical Plant is inadequate. On the other hand, Physical Plant's managers complained that some Regents communicate more with lower level employees of the department than with managers.

In our view, Regents should pursue their concerns about the operation of Physical Plant vigorously, but openly and collectively through Board and committee procedures. Regents should not intervene individually in internal management decisions. Also, Physical Plant top management and top University officials should work to improve their relationship with the Regents by striving for more open and clear communication.

C. PRODUCTIVITY OF SHOPS OPERATIONS

Physical Plant's 18 shops maintain the structural condition and mechanical systems of the University's buildings. They spend about 57 percent of their time doing "call-in" repairs in response to departmental requests or problems observed by Physical Plant workers. The shops spend about 24 percent of their time doing projects costing over $2,500, which require special authorization. And they spend 19 percent of their time doing preventive maintenance on equipment, which is intended to prolong equipment life.

The most recent national data showed that the University of Minnesota employed more shop workers than any other American university in 1984-85. The data also showed that the University's maintenance cost per 1,000 square feet of building space was the nation's highest among large schools.

1. Accountability

Evaluating the productivity and cost-effectiveness of Physical Plant work requires some indication of work completed. However, we found that:

- Documentation of work performed by the shops is consistently poor. The shops rarely report differences between the work originally authorized and the work actually completed.

For example, an October 1987 authorization called for "three months of repair and maintenance to steam distribution system." There was no cost estimate for the authorization. Two people worked full-time on the shop ticket from mid-November 1987 until late April 1988, and costs totalled about $59,000. The ticket gives no indication of what work was expected, nor does it provide any documentation of what was accomplished.

Lacking documentation of work completed, supervisors cannot assess productivity. Furthermore, our interviews indicated that it is not uncommon for the shops to charge work to a shop ticket other than the work originally authorized, even though the ticket rarely documents this additional work.

2. Work Assignment, Planning, and Follow Up

Most experts in maintenance management agree that effective planning and scheduling are important determinants of worker productivity. Planning is especially important in the University of Minnesota's setting, with its large campus, limited parking, and specialized trade labor.

We found that the University has an informal, decentralized system of planning shop work. Most shops do not prepare adequate daily work plans, and foremen have not been trained in scheduling. Only one shop that we contacted has a formal system for setting priorities among shop tickets.

We also found that workers often receive unclear assignments. Sometimes this occurs because shop tickets do not provide a clear description of the job to be done. However, this also results from insufficient "scoping" of jobs by supervisors or co-workers. Foremen expressed a desire to "scope" more jobs in the field before assigning them, but they said they lack the time. Also, we found that workers often are not informed about the quality of their work, partly because the Physical Plant shops lack a formal performance appraisal system.

We also examined how often the shops estimate the time and costs of upcoming work assignments. In a well-managed operation, nearly all jobs have estimates. We found that:

- Only 10 percent of closed shop tickets for the Minneapolis campus have estimates, and 56 percent of the St. Paul tickets have estimates.

For those jobs where estimates exist, Physical Plant usually underestimates labor hours.

3. Staffing

Physical Plant shops operate on a "day-worker" basis. The shops hire skilled trade workers to work from day to day and can lay them off any day there is not enough work. This system assumes that Physical Plant analyzes and predicts its workload, but we found that:

- Management lacks useful information on which to base staffing decisions.

Because there are so few time estimates, Physical Plant cannot accurately determine its current work backlog. Also, Physical Plant does not have reliable measures of workload or demand for services.

Although the day-worker concept assumes that management adjusts its staffing levels in accordance with perceived workload, we found that most Physical Plant trade workers are full-time, year-round employees. The shops avoid the use of short-term employees or layoffs.

We compared the University of Minnesota's shops to those at other Big 10 universities and other public and private Minnesota institutions. We found that:

- Physical Plant is one of the few employers whose maintenance trade workers are represented by multiple (19) locals and are paid prevailing wage rates.

For example, although most Big 10 universities hire unionized labor, only Wisconsin, Illinois, and Minnesota pay prevailing wages to maintenance workers. We compared the University's cost of doing several routine repair jobs to the cost at the University's coordinate campuses, the University Hospital, and the state of Minnesota. We found that Physical Plant's labor costs are higher than other institutions.

4. Transportation

An efficient maintenance transportation system minimizes the time spent getting to and from the job site. The lack of adequate parking at the University contributes to

Physical Plant's transportation problems. However, there are 91 "service vehicle spaces" plus many other spaces where vehicles could park.

Physical Plant employs 23 Teamster drivers to transport workers and materials. In our survey of Physical Plant shop workers, more than half of the workers said they often or usually have to wait too long for rides.

Of the various work rules that affect Physical Plant, probably none affects productivity as much as the informal requirement that the Teamster drivers provide most transportation. It is not cost-effective for Teamsters to transport workers to job sites if the workers could transport themselves. While several other Big 10 schools provide van services for workers, none restrict workers from driving themselves to work sites as much as the University of Minnesota.

In 1988, Physical Plant management created a Transportation Services Division to improve the transportation system. There have been many recent, worthy suggestions to management about possible improvements in the system, but there has been little action to address the system's problems.

5. Preventive equipment maintenance

The University developed a preventive maintenance program for equipment nearly 20 years ago. We found that about 20 percent of scheduled preventive maintenance activities are not done and that there are legitimate questions about the frequency with which preventive maintenance activities are scheduled. However:

- There has been little central direction of or engineering input into the preventive maintenance system.

For example, there are no policies on the type and frequency of maintenance that should be included in the system. Moreover, it is unclear what the respective roles of foremen, engineers, and managers should be in managing the program and determining appropriate levels of service. Finally, there is little basis for determining the cost-effectiveness of Physical Plant's preventive maintenance program.

6. Work quality

There is no easy way to compare the quality of work at Physical Plant to that of other institutions. However, based on a review of 40 shop projects by our technical consultants, we found that:

- The quality of work done by Physical Plant shops is consistently high.

Customers on these projects also expressed satisfaction with Physical Plant work and productivity.

D. CUSTODIAL AND GROUNDS MAINTENANCE OPERATIONS

The Custodial and Grounds Division is the largest in Physical Plant. As of June 1988, it employed about 440 full-time and 200 part-time workers. In general, our assessment of the University's custodial operation is positive. Based on a small sample of work sites, we found that:

- Custodians appear to be using appropriate work practices and doing a good job of cleaning.

We examined staffing assignments for University custodians and found that, overall, the square feet of building space assigned to custodians is about average for Big 10 schools. However, a proper evaluation of work assignments requires consideration of expected service levels. By reviewing the time required to meet service levels, we found that:

- Based on a review of 11 custodial work assignments, there appears to be some imbalance in employee workload.

For example, using industry standards, the daily work assigned to one full-time worker we examined should take about six hours to complete. The work of some other workers should require about 14 hours.

In part, this results from service levels that are sometimes unrealistic and should be re-evaluated. The service levels are generic, and generally not tailored to specific locations. In addition, the service levels do not contain time standards for work assignments.

We also examined the University's "deep cleaning" custodial crew, which Physical Plant initiated in 1986 to do intensive building cleaning. Customers seem satisfied with the crew's work, and our consultant deemed their methods appropriate. However, at their current rate of cleaning, the "deep cleaning" crews will be able to clean the entire University only once every 17 to 24 years, raising questions about their practical value at current staffing levels.

We also examined grounds maintenance staffing and found that:

- The University of Minnesota employs a smaller grounds staff than most other Big 10 schools, both in full-time and seasonal staff.

E. USED EQUIPMENT PROGRAM

In January 1988, an internal University audit criticized Physical Plant's program of purchasing used equipment in lieu of buying or leasing new items. The audit said the University's 1987 purchases occurred without adequate planning and the expenditures for equipment exceeded the fair market value.

Since the audit, Physical Plant officials have defended the program, claiming it was well-planned and will prove cost-effective. However:

- Our review of the program confirmed that the program was poorly planned, and we found that the program to date appears unlikely to generate the cost savings originally anticipated.

We found that division heads were not properly consulted about purchases. Of 33 items purchased in 1987, only 19 are in use, and seven of these are used infrequently or for different purposes than originally intended. So far, repair and refurbishing costs on the purchased equipment have exceeded savings generated by selling or terminating leases on other equipment. In recent months, Physical Plant has made greater efforts to involve equipment users in purchase decisions (there have been four purchases in 1988), and management has had greater control over the purchases.

F. RECOMMENDATIONS

To address weaknesses in Physical Plant's financial management, we recommend:

- Physical Plant should complete the development of a policy which clearly distinguishes routine from nonroutine services.
- Physical Plant should conduct a comprehensive review of building conditions to determine the extent of deferred maintenance needs.
- The University should separate the budget for fuel and utility costs from other Physical Plant operations.
- Physical Plant should modify its rate structure for charging other departments for services.
- The University should reorganize responsibilities so that the Associate Vice President does not have responsibility for Physical Plant personnel issues.
- Physical Plant should develop a uniform inventory system for its divisions, restrict access to inventory items, and realign duties to achieve proper control.
- Physical Plant should work with central administration to develop appropriate financial management information for all divisions.

The absence of documentation and plans makes it difficult to evaluate the productivity of Physical Plant's maintenance shops, but we think steps can be taken to improve management and productivity. We recommend:

- Physical Plant's top management should clarify the roles of foremen and area managers and provide them with training and authority to fulfill these roles.

With help, foremen could do a better job "in the field" of scoping jobs, developing schedules, and evaluating worker performance. The area managers need more support and guidance from top management, including greater authority to plan, manage, and evaluate the shops' work.

In Chapter 4 of this report, we make a series of recommendations intended to improve planning, scheduling, and communication in the shops. Introduction of computerized management systems will not help much until Physical Plant improves its manual systems of work planning.

It is clear to us that Physical Plant's shops are more specialized and expensive than similar operations elsewhere. We recommend:

- The University should review Physical Plant's current arrangement with the trades and seek ways to improve the cost-effectiveness and management of the shops.

There are various options that should be considered. For example, Physical Plant could use its specialized trade workers more efficiently by having general maintenance workers perform more routine jobs. In addition, the University should consider negotiating a more extensive, single contract with the trades to simplify labor relations. If University officials believe that cost-effectiveness cannot be improved through renegotiation of the contract with the trades, they should consider ending the arrangement and hiring shop workers through the University's civil service system. Whatever employment approach the University uses, the Regents should reconsider their policy of paying prevailing wages to shop workers, a policy that is unusual in the maintenance field and contributes to higher costs.

To improve preventive maintenance, we recommend:

- Physical Plant management should clarify staff roles and develop central policies on the inclusion of activities in the preventive maintenance schedule. Physical Plant should manage preventive maintenance more effectively by keeping better equipment maintenance records and incorporating preventive maintenance checklists in shop tickets.

To address inefficiencies in Physical Plant's transportation system, we recommend:

- Physical Plant should permit shop workers to drive themselves and co-workers to work sites and it should consider purchasing additional vehicles for certain shops. The department should encourage workers to walk and to use the intra-campus buses, and it should replace some of its 12-passenger vans and large trucks with smaller vehicles.

INTRODUCTION

Physical Plant Operations is a major support department at the University of Minnesota's Twin Cities campus. The department employs nearly 1,400 workers and spends $75 million a year. It has broad responsibility for a variety of maintenance and custodial tasks, including sweeping floors in classrooms, removing hazardous waste from research laboratories, heating the campus buildings, and repairing buildings and equipment.

Physical Plant is a very visible organization, and it attracts a good deal of criticism and scrutiny. Because of recent concerns about management at the University of Minnesota in general, and Physical Plant in particular, the Legislative Audit Commission directed us to conduct a financial audit and program evaluation of the management and operation of Physical Plant. In our study, we asked:

- Has Physical Plant established and implemented appropriate practices for managing its budgeting, expenditures, revenues, and personnel?

- Is Physical Plant effectively managed? Does it have the characteristics of well-managed organizations, including appropriate goals and plans, clear reporting relationships and communication, adequate resources, and useful management information systems?

- How productive are employees in the maintenance shops and custodial/grounds divisions? Is their work planned and supervised effectively? How do work rules and the terms of collective bargaining agreements affect productivity?

It is important to note that this study does not address all issues within Physical Plant, nor does it provide a comprehensive evaluation of every division. Due mainly to time considerations, we chose to focus on issues that seemed important and where we could make a unique contribution. For example, we focused our efforts on financial, shops, and custodial management because of the size and importance of these divisions. We did not focus on heating plant issues because many will be the subject of a Physical Plant study in the near future. Also, based on initial interviews, we focused on parts of Physical Plant where there seemed to be potential problems.

This study was conducted by staff from both the Financial Audit Division and the Program Evaluation Division. The financial auditors reviewed internal controls relating to financial transactions, analyzed policies for budgeting and allocating costs, reviewed purchasing and personnel transactions, and obtained independently processed copies of University accounting data files.

Staff from the Program Evaluation Division interviewed staff at all levels of the department and surveyed a sample of custodial and maintenance employees. They also reviewed data and records on staffing, workload, and work practices, and engaged three consultants to provide technical information on the efficiency of maintenance and custodial operations.

Chapter 1 of this report provides background information about Physical Plant, including its duties, organization, staff, and budget. Chapter 2 presents our analysis of the financial management of the department. Chapter 3 reviews key measures of organizational effectiveness, including organization, internal and external communication, and employee morale and job satisfaction. Chapter 4 discusses the productivity and efficiency of the operations and maintenance shops and considers a series of issues that affect productivity. In Chapter 5, we analyze the staffing and practices of the department's custodial operations. Finally, Chapter 6 includes our analysis of three additional issues: the department's used equipment purchase program, special personnel concerns, and Physical Plant's involvement in remodeling projects.

BACKGROUND

Chapter 1

The University of Minnesota's Physical Plant Operations is responsible for managing the physical condition of buildings and grounds on the University's Twin Cities campus. This chapter provides information about the department's function, organization, budget, and staff.

A. ORGANIZATION OF PHYSICAL PLANT

Physical Plant:

- maintains and repairs building interiors and exteriors (except the University Hospital);
- provides heat, air-conditioning, and electricity to buildings;
- provides custodial service (except the University Hospital, Coffman Union, and the dormitories);
- removes hazardous and nonhazardous waste; and
- maintains grounds, removes snow, and cleans streets.

Physical Plant also operates the Rosemount Research Center and provides heat and air-conditioning and interior and grounds maintenance to four off-campus locations: the Lake Itasca Forestry and Biological Station, the North Central Experiment Station in Grand Rapids, the Freshwater Biological Institute in Orono, and the Friedell Building in Rochester.

Physical Plant is not responsible for new construction or major remodeling. Those tasks are managed by the Physical Planning Department, which is currently separate from Physical Plant. The organization chart presented in Figure 1.1 shows that Physical Plant reports to the Associate Provost for Physical Plant who reports to the Vice President for Academic Affairs. The structure is unusual because Mr. William Thomas, the Associate Provost for Physical Plant, also reports to the Vice President for Finance and Physical Planning. As Associate Vice President for Personnel, he oversees the University's Personnel Department.

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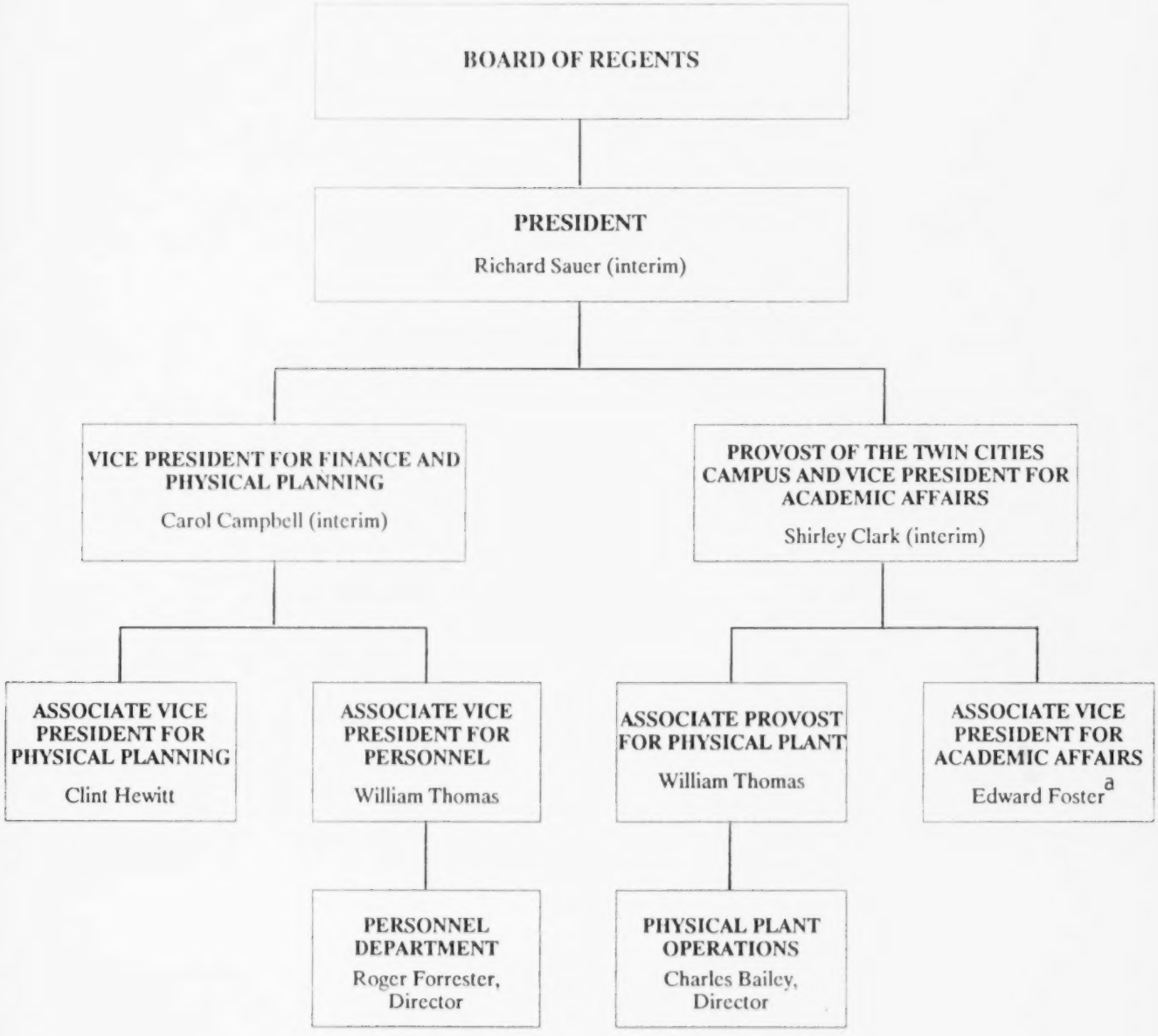
FIGURE 1.1

ORGANIZATION OF PHYSICAL PLANT AND PHYSICAL PLANNING



[a]Mr. Foster has acted on behalf of the Provost and occasionally serves as a communication channel between the Provost and Physical Plant. However, the Associate Provost for Physical Plant reports directly to the Provost, not to Mr. Foster.

Physical Plant is presently divided into nine divisions, as shown in Figure 1.2. Three maintenance and operations divisions provide the skilled trade workers, such as electricians, plumbers, carpenters, and painters, who maintain and repair buildings and equipment on the Twin Cities campus. This includes preventive maintenance (inspection, testing, and servicing equipment) and responding to repair calls from building users. In total, Physical Plant maintains more than 12 million of the University's 18 million square feet of building space. The trade workers are assigned between 5,500 and 9,000 jobs per month.

The Custodial and Grounds Division cleans the insides of buildings and maintains more than 500 acres of grounds on the Minneapolis and St. Paul campuses. It also removes snow and cleans streets. Nearly half of Physical Plant's employees are custodians or grounds workers.

The Heating Plant Operations Division is responsible for operating and maintaining the University's three heating plants, two in Minneapolis and one in St. Paul. These heating plants have 14 boilers that generate steam for heating and cooling. About 10 miles of steam tunnels distribute the steam to campus buildings. This division also is responsible for distributing electricity purchased from Northern States Power Company to campus buildings.

The Environmental Operations Division manages the removal of hazardous and nonhazardous waste from the University. This includes collecting chemicals, identifying and storing hazardous waste, operating storage facilities, and reporting on hazardous waste generation and disposal. Physical Plant removed about 185,000 pounds of hazardous waste in 1987.[1] The division collects and disposes of garbage, dead animals, and bio-infectious waste from University laboratories. It also manages the University's recycling and waste abatement programs.

The Transportation Services Division was created in January 1988. It is responsible for managing all of Physical Plant's vehicles and heavy equipment. The division maintains and repairs Physical Plant's vehicles as well as farm equipment owned by the Institute of Agriculture. The division employs 23 service delivery drivers to transport trade workers and materials to work sites.

The Engineering and Planning Division maintains an automated temperature control system for University buildings. Division engineers also design maintenance systems and provide advice on Physical Plant projects. The Administrative Control Division is responsible for record keeping, department payroll and accounting. Physical Plant keeps track of its expenses by requiring each maintenance job to have a "shop ticket." Labor and material expenses related to a job are then assigned to its shop ticket.

B. STAFFING

Physical Plant employs nearly 1,400 workers under four separate arrangements: skilled trade workers, workers represented by the Teamsters Union, civil service staff, and student workers. Table 1.1 shows the numbers of employees of each type in each of the nine divisions. In this section, we discuss each category of worker.

FIGURE 1.2

ORGANIZATION OF PHYSICAL PLANT OPERATIONS

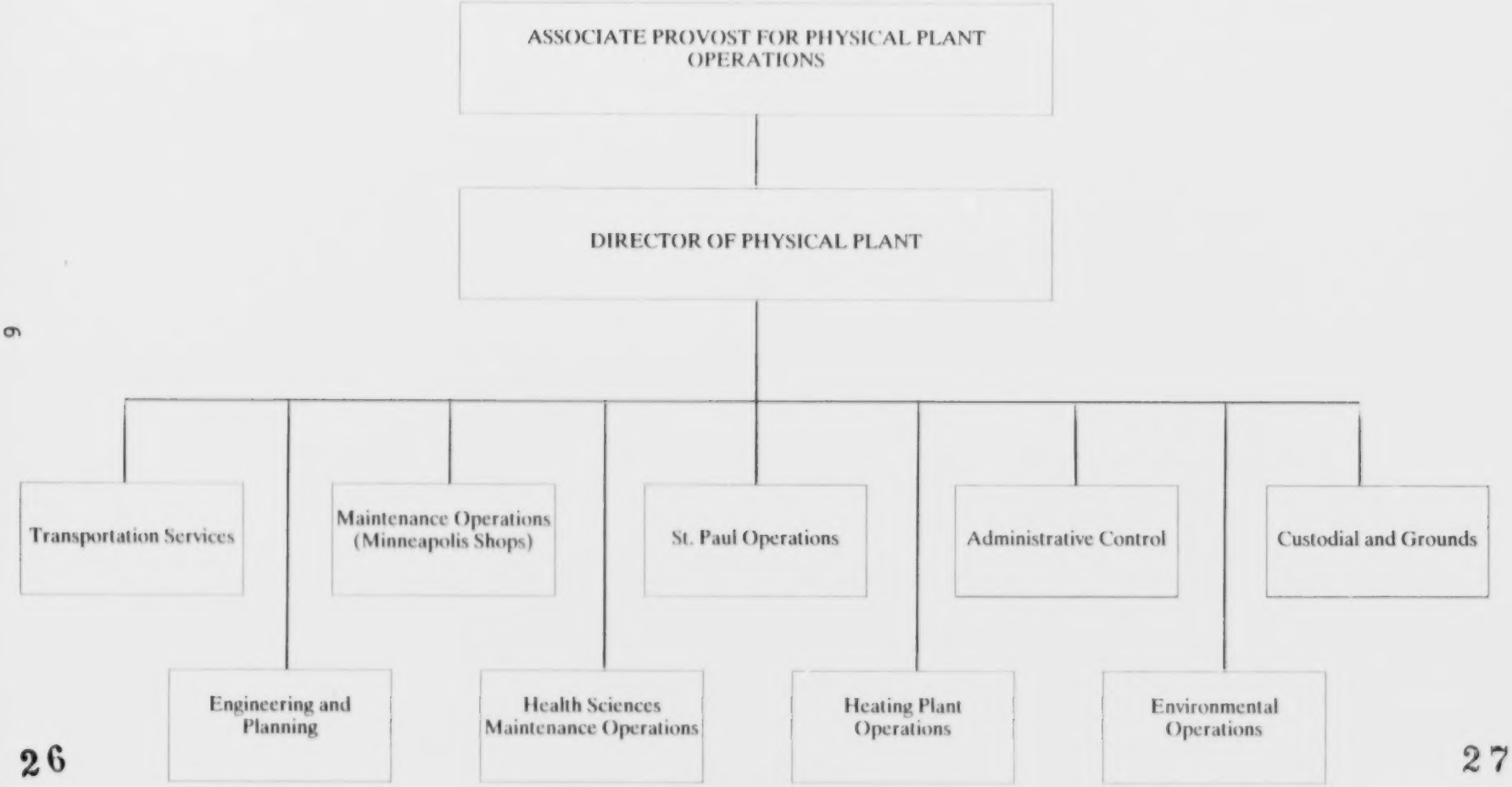


TABLE 1.1

PHYSICAL PLANT STAFFING

Employee Type	Division									
	Transportation	Engineering & Planning	Maintenance Operations	St. Paul Operations	Health Sciences Maintenance Operations	Custodial & Grounds	Heating Plant Operations	Administrative Control	Environmental Operations	TOTAL
Teamsters	35	5	57	30	38	478	74	--	16	733
Civil Service	8	21	22	5	7	37	14	16	13	143
Students	3	10	13	4	6	127	5	6	22	196
Trades	--	--	197	58	46	--	--	--	--	301
TOTAL	46	36	289	97	97	642	93	22	51	1,373

Source: Physical Plant April 1988 division status reports, Employee List Recap Sheets, and Administrative Control Division information.

NOTE: It was not possible to get consistent information on staff complement from different Physical Plant sources. These are estimates as of April 1988 and represent the number of workers, not full-time equivalents.

1. Teamsters

Teamsters Local 320 (Public and Law Enforcement Employees) represents about 733 non-trade, non-supervisory personnel at the University. The current contract establishes 94 job classifications at the University, slightly more than half at Physical Plant, for which the Teamsters Union has exclusive representation.[2] Each biennial contract renewal defines new jobs and phases out others.

The Teamster contract addresses the following issues:

- Seniority. The most senior employees receive priority for overtime, on-call work, transfers, layoffs and recalls, reclassifications, filling vacancies, and vacations.

- Disciplinary measures for just cause. Employees can receive oral reprimands, written reprimands, suspension without pay, and discharge, not necessarily in sequence.

- Work time. Most Teamsters work 40 hours a week. Regular full-time shifts are 8.5 hours, from 8:00-4:30, including an unpaid 30-minute lunch.[3] All employees receive a 15-minute coffee or rest period during each four consecutive hours of work. Employees who report for a normal shift are entitled to at least four hours work or four hours pay if no work is available.

- Premium pay. To compensate for hazardous or specialized work, Physical Plant pays wage premiums to workers in the chemical department and storehouse, hazardous materials disposal specialists, heavy equipment operators, and some heating plant operating engineers.

The contract dictates minimum and maximum salaries and probationary increases for each job classification, with a mandated annual increase each July 1. Salaries range from $6.87 an hour for a starting building and grounds worker to $13.59 an hour for a principal operating engineer. Benefits amount to approximately an additional 20 percent of salary.

As of April 1988, the 733 employees represented by the Teamsters included 125 in the Minneapolis, St. Paul, and Health Sciences shops, 478 in the Custodial and Grounds division, 74 in the Heating Plants, 35 in the Transportation unit, and 16 in Environmental Operations. During the University's 1982 budgetary retrenchment, Physical Plant laid off about 150 full-time-equivalent custodians. The number of custodial staff began to increase again in 1986 and reached pre-retrenchment levels in 1987. The shops laid off about 20 Teamster employees in 1982, and few of those positions have been refilled.

2. Civil Service

Physical Plant employs 143 civil service employees in clerical and non-academic supervisory positions in every division of Physical Plant.[4] Civil service provisions for work time, seniority, and benefits are similar to those found in the Teamsters' contract. In addition, civil service rules contain provisions for paid maternity and paternity leave and a performance review process.

Civil service salaries are based on the compensation plan prepared by the University Personnel Director and approved by the Civil Service Committee and the Board of Regents. The salary range is from $7.93 an hour for a starting senior office assistant to $26.17 an hour for an assistant director, not including benefits.

3. Students

University of Minnesota students have first priority for vacant part-time (less than 30 hours) University positions. Student employment is considered a component of the University financial aid program. Students occupy most, but not all, of the part-time positions at Physical Plant. Student work rules closely follow civil service rules.

Student salaries follow the civil service compensation plan. Students are entitled to time and a half pay (or compensatory time) if required to work on an official University holiday or more than 40 hours a week. Student employees are not eligible for vacation, sick leave, unemployment compensation, or staff health insurance coverage. They have no payroll deductions for social security or retirement. Students are eligible for workers' compensation.

In April 1988, approximately 196 students worked at Physical Plant in all divisions. The number fluctuates widely throughout the year from about 150 to 250.[5]

4. Skilled Trade Workers

In 1987 the University signed the first three-year master contract with the Minnesota Building and Construction Trades Council, which represents 18 building trade locals.[6] It was negotiated by the Associate Provost for Physical Plant in response to a September 1986 inquiry by a member of the Board of Regents. A master contract which defers to individual trade contracts is unique among Minnesota employers. The Building and Construction Trades Council says other local public employers have shown interest in the idea.

Prior to 1987, there was no written agreement between the University and skilled trade workers.[7] For more than 50 years, Physical Plant trade workers have been hired under individual trade contracts and paid prevailing wage, with support from the Board of Regents.[8] "Prevailing wage" is the wage commonly paid to the largest number of workers of the same trade in the local area. For each skilled trade, prevailing wage is established as union scale in the individual trade union contracts, which are negotiated between the union and large state or local employer associations. Before the master contract, Physical Plant work rules and labor relations were also loosely based on the individual trade agreements. The unions allowed the University to ignore individual contract clauses that were irrelevant or unacceptable to the University. The master contract simply formalized the wage rates and labor relations that had been in place for the last 50 years.

The master contract covers all construction and maintenance work at the metropolitan area campuses and facilities. In it, the University agrees to honor individual trade union contracts except for 18 provisions that "do not pertain" to the University of Minnesota. Among other things, this arrangement allows the University to use time clocks and require employees to transport materials. It also relieves the University of having to reimburse trades workers for parking or give standard notice to terminate workers.

The master contract also contains an agreement to abide by the subcontracting policy established by the Board of Regents in 1973 and amended in 1980. The policy states that all contractors or subcontractors for construction, repair, or alteration work exceeding $2,500 must pay the area's prevailing wage rate to workers employed directly on the job site. According to the policy the prevailing wage rate is determined by the "appropriate University officer" based on the wage paid to the largest number of those so employed in the local labor market.

Since the master contract makes no exception regarding wages, Physical Plant continues to pay trade workers prevailing wage based on individual trade contracts. Prevailing wages vary from $17.92 an hour for a journeyman sign painter to $25.25 an hour for a journeyman electrician. These rates include benefits, which are distributed by the unions. Foremen and general foremen receive a higher rate.

Physical Plant currently employs about 300 skilled trade workers in the Minneapolis, St. Paul and Health Sciences shops. This number fluctuates slightly as workers are laid off or hired due to seasonal workload changes or for budgetary reasons. Physical Plant laid off about 22 workers in response to budget cutbacks in 1982 and 1983. In 1984 and 1985, however, about 50 workers were hired. Physical Plant's most recent major layoff occurred in late 1986 and early 1987 due to budget difficulties and perceived overstaffing. Physical Plant laid off approximately 70 trades workers, primarily from the carpentry, construction, electric, pipe covering, sheet metal and steam shops. Since then, approximately 40 have been rehired.

C. GENERAL FINANCIAL INFORMATION

The University accounting system does not provide comprehensive financial information on the Physical Plant. Approximately one-third of Physical Plant costs are funded from the budgets of other University departments and shown as costs of those departments. As a result, much of the payroll cost incurred by the Physical Plant work force and many of the materials purchased by Physical Plant are not presented by the University accounting system as costs related to Physical Plant. For Fiscal Year 1987, Physical Plant costs are reported as $52 million on University accounting reports. However, our calculations indicate that Physical Plant actually incurred $74 million of costs in 1987.

The difficulty of obtaining complete financial information is best illustrated by the method used to account for payroll. Initially, payroll costs for the majority of Physical Plant workers are recorded in a payroll suspense account called the Base Reserve Account. The payroll costs are redistributed out of the Base Reserve Account into the various University budgetary accounts. Information recorded on the Physical Plant Daily Report Payroll system is used as the basis for redistributing costs from the Base Reserve Account. Daily Report Payroll is described in Chapter 2. Ultimately about two-thirds of the payroll costs are charged against Physical Plant budgetary accounts and the remainder is charged to other departments. However, during Fiscal Years 1986 and 1987, the Maintenance Operations Division had a majority of its costs charged to other departments. This was due in part to the fact that at that time the division was performing remodeling activities. This function was discontinued during Fiscal Year 1988.

We felt that Physical Plant operations could best be understood if financial information was presented on its full cost of services. Therefore, we obtained copies of University accounting files and extracted the relevant financial information. The process was difficult. We were careful to verify the accuracy of the accounting files we were given and of the financial information we generated. We are satisfied that the information is materially correct and that it fairly presents the total cost of Physical Plant services for fiscal years 1986 and 1987. University accounting records for 1988 were incomplete at the time of our audit.

Table 1.2 summarizes Physical Plant costs for Fiscal Years 1986 and 1987. Costs are presented by functions which roughly correlate to the Physical Plant divisions. Information is not available to separate the costs incurred by the four divisions providing repair and maintenance services. Accordingly, we had to combine the financial information pertaining to repairs and maintenance into one functional category.

TABLE 1.2

UNIVERSITY OF MINNESOTA PHYSICAL PLANT
EXPENDITURES BY FUNCTION
Fiscal Years 1986 and 1987

	1986	1987	Percent Change
Repairs and Maintenance	$34,342,953	$31,425,849	- 9.3%
Utilities	29,606,672	26,819,823	-10.4
Custodial and Grounds	10,873,151	12,976,531	16.2
Environmental	1,813,233	1,522,061	-19.1
Administration	1,878,727	1,429,204	-31.5
TOTAL	$78,514,736	$74,173,468	- 5.9%

Source: Office of the Legislative Auditor calculations from University accounting records.

University accounting records also do not provide sufficient information to generate an analysis of divisional costs by category, such as payroll, supplies and materials, other administrative expenses, or capital assets. In total, however, payroll comprises $37 million of the $78 million spent in 1986 and $38 million of the $74 million spent in 1987.

Nearly two thirds of Physical Plant costs are financed with Operations and Maintenance funds provided by the central administration. Most remaining costs are financed from the budgets of other departments. In some instances, funds are transferred from another department budget to Physical Plant, such as some Athletic Department funding and indirect cost recoveries from central administration. However, the majority of the

charges to other departments are recorded in accounts outside the control of the Physical Plant. Approximately $2 million each year is funded through external billings, primarily for utility services provided to outside customers. Tables 1.3 and 1.4 summarize Physical Plant funding sources.

TABLE 1.3

UNIVERSITY OF MINNESOTA PHYSICAL PLANT
FUNDING SOURCES
Fiscal Year 1986

	Operating Budget	Other University Departments	External Billings	Total Available Funds
Repairs and Maintenance	$14,423,568	$19,541,600	$ 377,785	$34,342,953
Utilities	21,896,146	7,193,025	1,502,427	30,591,598
Custodial and Grounds	10,176,274	696,877		10,873,151
Environmental	1,056,620	756,613		1,813,233
Administration	1,566,702	312,025		1,878,727
Residual Budget Funds[a]	5,035,896			5,035,896
Total Funding Sources	$54,155,206	$28,500,140	$1,880,212	$84,535,558

Source: Office of the Legislative Auditor calculations from University accounting records.

[a]See Table 2.2 for an analysis of the residual balance. Physical Plant reported $3.9 million of encumbrances against the $5 million balance.

The amounts shown as funded by the Physical Plant operating budget represent expenditures charged against the Operations and Maintenance (O & M) funds. Actually, Physical Plant had more O & M funds available than were spent each year, because University policy allows departments to retain any residual O & M funds. The residual funds remaining at year end are shown on the schedules. There may be encumbrances or commitments against certain of these funds which will result in expenditures in subsequent years. Chapter 2 discusses the Physical Plant operating budget in more detail.

Our review of Physical Plant's financial management considered both its internal activities as well as its relationship to various other University administrative departments. In some cases Physical Plant is fairly independent when making financial decisions. However, it is subject to various centralized University procedures and controls and must work with established University systems.

Figure 1.3 identifies those other University departments which play a role in the financial management of Physical Plant.

TABLE 1.4

UNIVERSITY OF MINNESOTA PHYSICAL PLANT
FUNDING SOURCES
Fiscal Year 1987

	Operating Budget	Other University Departments	External Billings	Total Available Funds
Repairs and Maintenance	$14,920,030	$16,079,063	$ 426,756	$31,425,849
Utilities	20,774,822	7,796,392	1,633,432	30,204,646
Custodial and Grounds	11,529,507	1,447,024		12,976,531
Environmental	98,338	1,423,723		1,522,061
Administration	1,203,836	225,368		1,429,204
Residual Budget Funds[a]	5,423,779			5,423,779
Total Funding Sources	$53,950,312	$26,971,570	$2,060,188	$82,982,070

Source: Office of the Legislative Auditor calculations from University accounting records.

[a]See Table 2.3 for an analysis of the residual balances. Physical Plant reported $2.7 million of encumbrances against the $5.4 million balance.

Certain accounting functions have been delegated directly to Physical Plant because of its size and the complexity of its operations. Therefore, Physical Plant has approximately 20 staff who are responsible for financial controls and accountability.

Physical Plant financial activity is processed through and recorded in a centralized accounting system. The University utilizes a computerized General Ledger system to provide various accounting controls as well as financial information necessary for both internal and external reporting needs. The General Ledger system interfaces with other systems established to provide various information. Certain of these systems are unique to Physical Plant. For example, the Daily Report Payroll system accounts for payroll costs charged to various jobs from information recorded by employees on daily time cards. Costs are accumulated based on charges against "shop tickets," which are control documents set up when a specific job assignment is made. Physical Plant also administers an Authorization Accounting system that accumulates all costs relating to a given authorization. An authorization is an encumbering document obligating funds (usually more than $2,500) for specific projects done by the Physical Plant shops. The system provides summary financial information by shop for the various authorizations. The Daily Report Payroll system updates to the Authorization Accounting system each pay period.

FIGURE 1.3

UNIVERSITY OF MINNESOTA
CENTRALIZED FINANCIAL CONTROLS

The following is a list of University of Minnesota administrative offices and the functions they serve that affect Physical Plant:

MANAGEMENT PLANNING AND ANALYSIS

- Prepares biennial budget request to the Legislature.

BUDGET OFFICE

- Prepares annual budget.

ACCOUNTING RECORDS AND SERVICES

- Maintains general ledger accounting system.
- Provides accounting reports to user departments.
- Processes receipt and disbursement transactions.
- Provides budget control.
- Accounts for all equipment.

PAYROLL

- Processes payroll and generates warrants.

PERSONNEL

- Administers civil service system.

PURCHASING

- Establishes purchasing guidelines.
- Negotiates centralized contracts.

AUDITS

- Performs periodic internal audits.

FOOTNOTES

[1]Includes waste chemicals and polychlorinated biphenyls.

[2]The contract does not cover those employees who work less than 35 percent of the normal work week or 67 days per year nor any students or confidential employees.

[3]Custodians on the night shift work 8 hour shifts with a paid 30 minute lunch.

[4]Physical Plant also has four academic professional/administrative positions, which are not part of the civil service system. These are the director, associate director, and two of the assistant directors.

[5]Some Teamsters are students but do not fill "student worker" positions.

[6]Although Physical Plant employs sign painters, the sign painters union is not a member of the Building and Construction Trades Council and is therefore not covered by the master contract.

[7]Prior to 1966, trade workers could opt for benefits paid directly by the University instead of through the unions, as they are now. According to Physical Plant and University staff, all other conditions prior to 1966 were as they are today.

[8]There is no record of the initial Regents' decision to pay prevailing wage, although there is evidence of the practice as early as 1937. The Associate Provost for Physical Plant cited Rule 5, Section 3 of the University civil service rules as the source of the current policy to pay prevailing wage to trade workers. The Board of Regents approved this rule in the 1940's.

FINANCIAL MANAGEMENT

Chapter 2

Physical Plant Operations spends approximately $75 million annually. In this chapter we examine various issues relating to Physical Plant financial management. We asked:

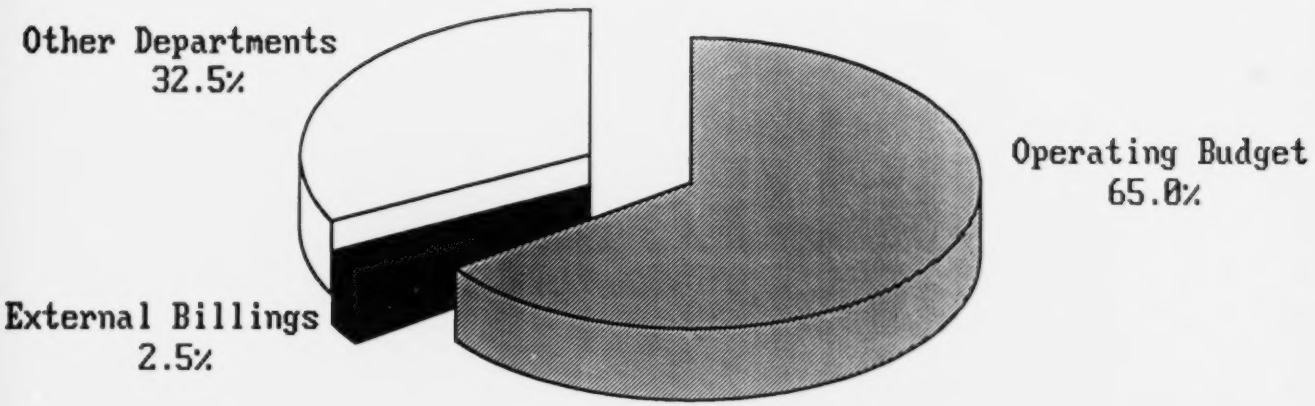
- Are University and Physical Plant budgetary practices appropriate to effectively manage resources and control expenditures?
- Does Physical Plant allocate costs to appropriate funding sources in a rational manner?
- Has Physical Plant established adequate controls over the personnel process and disbursements?

A. FUNDING AND BUDGETARY PHILOSOPHY

Nearly two-thirds of Physical Plant costs are financed through its operating budget provided from the University's Operations and Maintenance (O & M) funds, as illustrated in Figure 2.1. O & M funds are allocated by the University's central administration based on its budget principles which are discussed later in this chapter. Physical Plant's operating budget is intended to finance most routine maintenance and repair services provided to those University departments which also receive O & M funds. These functions are referred to as "supported" departments, and generally include services provided to academic and administrative buildings. Routine services provided to supported departments may range from replacing a deteriorated roof to repairing plumbing fixtures.

Most of the remaining one-third of Physical Plant costs are financed by the budgets of other departments. Physical Plant uses a variety of accounting methods to allocate or charge costs to other department budgets. The departments charged are often self-supporting and do not receive O & M funds. Physical Plant refers to these as "nonsupported" departments. They include operations such as dormitories, food service, bookstores, and the athletic department. In addition, both supported and nonsupported departments are charged for services which are not considered to be routine. Typically, any service which is requested by a department is classified as nonroutine and charged against that department's budget. Examples of nonroutine services include the installation of shelving, additional electrical outlets, or light fixtures.

Figure 2.1
University of Minnesota Physical Plant
Funding Sources - 1987



Physical Plant's operating budget has been established on a basis which is philosophically consistent with the advice of *College and University Business Administration* (CUBA), the primary reference source for guidance on accounting practices of higher education institutions. CUBA suggests that:

> The physical plant budget should provide for normal recurring operation and maintenance of facilities. Funds for other purposes, such as building alterations for a particular department or college, should come from other sources, such as the department or college making the request. That is, no services other than routine operation and maintenance should be provided unless they are charged to the user department or college or to a special account provided for such projects.

The various Physical Plant divisions retain some autonomy in deciding whether costs will be assumed by their operating budget or charged to another University department.

We found that:

- There is no definitive policy specifying routine and nonroutine services, which could leave University departments subject to financial uncertainty and inconsistent treatment.

This is primarily an issue with the shop work, and could be compounded because of the magnitude of the University's deferred maintenance burden. A University department which has substantial deferred maintenance for routine services such as painting and carpeting may be expected to finance an inequitable share of Physical Plant costs. Conversely, the Physical Plant operating budget could be absorbing more costs for these services than it should.

The director of the Administrative Control Division told us that she felt there were some inconsistencies within the Physical Plant divisions as to what services would be considered routine or nonroutine. She also said Physical Plant was in the process of developing guidelines to improve consistency between divisions in applying the definition of routine and nonroutine.

We recommend:

- Physical Plant should complete the development of a policy which clearly defines the distinction between routine and nonroutine services for all divisions.

B. THE PHYSICAL PLANT OPERATING BUDGET

Two offices oversee the preparation and implementation of University operating budgets. The Management Planning and Analysis Division prepares the University biennial budget request to the Legislature. The University Budget Office implements the annual budget process for University departments. Major financial resources, such as tuition and most state appropriations, are combined to form the primary University funding source, Operations and Maintenance (O & M) funds. O & M funds receive the most attention during the University budget process.

The University Management Committee establishes budget principles each January. The principles identify the general budget philosophy, current budget priorities, and standard inflationary increases. The previous year's budget allotment is the basis for establishing the new budget. Thus, the principles focus on changes anticipated from the prior year.

The budget principles are submitted to the Board of Regents for comment and final approval. The final University budget plan, showing how University funds will be allocated for the year, is completed by May, except in state budget years when it may be delayed for approximately two months.

The University Budget Office prepares allotment letters based on the final budget plan. These letters identify changes from the previous year's budget allotment and are sent to the directors of University departments. Table 2.1 summarizes the Physical Plant O & M budget allotments for Fiscal Years 1986 through 1988.

Table 2.1 illustrates funding level changes affecting the Physical Plant operating budget each year. The changes indicate how University management has responded to new demands for Physical Plant services and other program modifications. For example, both in 1985 and 1986, Physical Plant was provided additional funding because support activities were expanded into new building space and an increase in service levels was anticipated. Also, a 1987 change recognized that the Hazardous Waste program was to be funded from indirect cost recoveries rather than O & M funds.

University budget policies allow departments to retain any surplus funds resulting from unspent O & M allotments. Departments are also required to manage any deficits resulting from spending in excess of budgetary authority. These budget policies were phased in over several years and became fully effective for fiscal year 1987.

The Physical Plant operating budget is derived by combining the annual budget allotment with any residual O & M funds from the prior year. Tables 2.2 and 2.3 summarize the financial activity of the Physical Plant operating budget for Fiscal Years 1986 and 1987, respectively.

Our analysis of the Physical Plant operating budget revealed two major concerns: funding of deferred maintenance projects and an inability to accomodate the volatility of fuel and utility costs.

Deferred maintenance represents the cumulative financial effects of not properly maintaining capital assets.[2] The University has identified more than $13 million in necessary deferred repair and maintenance projects. Physical Plant admits that the estimate is very rough and that additional expertise is needed to develop more accurate data. We found no reason to doubt that the University has a large backlog of deferred maintenance. In fact, the extent of deferred maintenance has resulted in a substantial budget demand that probably exceeds Physical Plant's own resources. In our opinion:

- The level of deferred maintenance and the absence of a comprehensive review of building conditions constitutes a serious financial management weakness.

TABLE 2.1

UNIVERSITY OF MINNESOTA PHYSICAL PLANT
ANNUAL BUDGET ALLOTMENTS
1986 - 1988

	Fiscal Year		
	1986[a]	1987[b]	1988
Prior Year Budget Allotment	$41,267,713	$47,373,285	$47,052,664
Changes to the Budget Base			
Fuel & Utility Adjustments[c]			
Recurring	1,616,600	874,708	2,167,200
Nonrecurring	3,072,700	(3,072,700)	3,115,200
Allowance for New Space	1,382,503	1,471,054	
Salary & Fringe Benefit Adjustments		1,167,110	1,891,515
Solid & Hazardous Waste Adjustments		(834,133)	1,000,000
Custodial & Grounds Adjustment			500,000
Activities Transferred to Physical Planning			(639,888)
Other	33,769	73,340	230,418
Annual Budget Allotment	$47,373,285	$47,052,664	$55,317,109

Source: University Budget Office allotment letters and Physical Plant budgetary worksheets.

[a]In 1986, $590,510 was ultimately allotted to other departments, but remained part of part of the Physical Plant budget base.

[b]In 1987, $705,700 was ultimately allotted to other departments, but remained part of the Physical Plant budget base. Also, $245,207 was allotted from another department into the Physical Plant budget, but did not become part of the Physical Plant budget base.

[c]Recurring allotments are incorporated into the budget base whereas nonrecurring allotments are provided for one year only and are eliminated the following year.

TABLE 2.2

UNIVERSITY OF MINNESOTA PHYSICAL PLANT
OPERATIONS AND MAINTENANCE FUNDS
BUDGET VERSUS ACTUAL EXPENDITURE COMPARISON
1986

	Original Annual Budget Allocation	Final Budget Allotment	Actual Expenditures	Year-End Balances		
				Encumbrances[a]	Unreserved	Total
Repairs and Maintenance	$13,067,032	$18,720,936	$14,423,569	$3,148,231	$1,149,136	$4,297,367
Utilities	21,964,450	22,005,142	21,896,147	131,571	(22,576)	108,995
Custodial and Grounds	9,818,971	10,309,403	10,176,274	133,129	0	133,129
Environmental	834,133	1,166,338	1,056,620	109,718	0	109,718
Administration	1,098,189	1,953,389	1,566,702	368,419	18,268	386,687
Total	$46,782,775	$54,155,208	$49,119,312	$3,891,068	$1,144,828	$5,035,896

Source: Physical Plant budget worksheets and accounting reports.

[a]Primarily, encumbrances represent projects which have been authorized, but not completed at year end. However, according to Physical Plant calculations $801,364 of the encumbrances represent projects for which no services had yet been provided.

TABLE 2.3

UNIVERSITY OF MINNESOTA PHYSICAL PLANT
OPERATIONS AND MAINTENANCE FUNDS
BUDGET VERSUS ACTUAL EXPENDITURE COMPARISON
1987

	Original Annual Budget Allocation	Final Budget Allotment	Actual Expenditures	Year-End Balances		
				Encumbrances[a]	Unreserved	Total
Repairs and Maintenance	$14,075,648	$18,011,876	$14,920,029	$2,301,679	$ 790,168	$3,091,847
Utilities	20,466,233	20,946,445	20,774,821	112,099	59,525	171,624
Custodial and Grounds	10,795,239	11,603,665	11,529,506	83,133	(8,974)	74,159
Environmental	43,837	120,580	98,338	15,063	7,179	22,242
Administration	1,211,214	3,267,744	1,203,837	154,203	1,909,704	2,063,907
Total	$46,592,171	$53,950,310	$48,526,531	$2,666,177	$2,757,602	$5,423,779

Source: Physical Plant budget worksheets and accounting reports.

[a]Primarily, encumbrances represent projects which have been authorized, but not completed at year end. However, according to Physical Plant calculations $381,325 of the encumbrances represent projects for which no services had yet been provided.

The University did complete an engineering review of all buildings used by the Institute of Technology. However, a comprehensive review of all University buildings has not been conducted. Without such a review, management is unable to make sound budget decisions to finance maintenance in an effective and economical manner, thereby preserving its capital assets and reducing long term repair and maintenance costs. Current Physical Plant management has addressed this issue in part by budgeting $300,000 for an engineering study of the heating plants.

In response to its deferred maintenance needs, the University sought an additional $16 million from the Legislature for the 1987-89 biennium. The Legislature responded by providing approximately $8 million in additional funding for the biennium. However, we are concerned that the University sought additional funds from the Legislature without fully considering its own accumulated funds to address the problem. We found that:

- During Fiscal Year 1987, Physical Plant transferred $1.2 million out of its repair and maintenance accounts and into an administration account for other uses.

Starting in Fiscal Year 1987, residual O & M funds were removed from control of the Physical Plant divisions and consolidated into a Physical Plant administration account. The Physical Plant director said that residual funds are not taken from a division if they are being used for a justified cause. Approximately $1.9 million of residual funds had been transferred into the administration account as of June 30, 1987. In addition to the $1.2 million from various repair and maintenance accounts, about $400,000 came from custodial accounts, and the remainder was from other accounts.

Physical Plant management intends to use the residual funds for its most pressing financial needs. For example, in 1988 approximately $175,000 was used to purchase personal computers for a department computer system currently in the developmental stage. Funds were also used in 1988 to finance the $400,000 deficit which Physical Plant assumed when the St. Paul Grounds Division was transferred from the Institute of Agriculture.

Table 2.3 shows that Physical Plant had accumulated over $5.4 million of unspent O & M funds by June 30, 1987. In addition to the $1.9 million in the administrative account, most of the remaining funds were reported in repair and maintenance accounts: $2.3 million of encumbrances and nearly $800,000 of unreserved funds. However, repair and maintenance accounts typically have shown a large encumbered amount at the end of each year. The encumbrances result because, ordinarily, all estimated costs are encumbered when a project is authorized, regardless of when the work is scheduled to be performed. According to Physical Plant calculations, nearly $400,000 of the $2.3 million in encumbrances represented projects which had not yet begun. Presumably, the remaining encumbrances represent projects in varying stages of completion. We believe that:

- Projects spanning more than one fiscal year may be unduly occupying funds which would otherwise be available for expenditure.

For example, projects with total estimated costs of $1.2 million were encumbered in July 1986. Only $344,000 was spent on these projects during Fiscal Year 1987, resulting in an encumbrance balance of over $800,000 as of June 30, 1987. During Fiscal Year 1988, an additional $477,000 was spent and approximately $200,000 was cancelled. On June 30, 1988, two years after the projects were initiated, $133,000 remained in the encumbrance balance.

Clearly, prudent financial management practices dictate that projects not be authorized unless adequate funding is available. However, encumbrance practices which are too conservative may result in not fully utilizing available resources to address critical problems. Physical Plant staff told us that some large scale projects are scheduled and funded in phases over more than one fiscal year. Potentially, Physical Plant could free additional resources by using a similar practice for more projects and encumbering only those funds which are scheduled to be expended during the current fiscal year. The additional resources could then be utilized for such critical needs as deferred maintenance costs. In conjunction, stringent controls would also have to be devised so that authorized but unfinished projects would be encumbered in the ensuing fiscal year.

Our second concern relates to how the University budgets for fuel and utility costs. We found that:

- Fuel and utility costs have caused the Physical Plant operating budget to be too volatile, and the University is unable to effectively control Physical Plant's budget.

Due to seasonal fluctuations and the lack of predictability in how rates will change, fuel and utility costs are subject to significant variations from year to year. The University Budget Office, through the budget process, attempts to address the volatility of fuel and utility costs by annually adjusting the Physical Plant budgets for changes in these costs. For example, referring again to Table 2.1, in Fiscal Year 1986 Physical Plant received $4.6 million to fund $3 million in fuel and utility deficits from prior years and $1.6 million to fund future fuel reserves. The $3 million was a one time or nonrecurring allotment which was eliminated from the base in Fiscal Year 1987. The $1.6 million remained a part of the base, as did recurring allotment increases of $875,000 in Fiscal Year 1987 and $2.2 million in Fiscal Year 1988. In addition, in Fiscal Year 1988 Physical Plant received a special nonrecurring allotment of $3.1 million for the GRID ICES program. This amount was removed from the budget base in Fiscal Year 1989. These continuous adjustments to the fuel and utility budgets demonstrate that these accounts cannot realistically be budgeted in the same manner as other accounts.

Because of the volatility of fuel and utility costs, the estimates Physical Plant uses in developing the budget may vary considerably from the actual costs incurred. Budgetary control over these costs is lost when Physical Plant is responsible for managing them because of the University policy that allows departments to retain budget surpluses. For example, if there is a mild winter utility costs presumably will decline. If costs are less than the budgeted amount, Physical Plant could retain the excess balances. Similarly, Physical Plant could even benefit if costs are more than anticipated because of its authority to increase the rates it charges other University departments. In general, the University lacks budgetary control over fuel and utility accounts and should administer them separately from other Physical Plant accounts. The University Budget Office recently acknowledged the need to separately manage the fuel and utility accounts.

In summary, we recommend that:

- Physical Plant should develop a comprehensive system, including cost estimates, to identify deferred maintenance projects. These projects should be considered in the budget process.

- The Budget Office and Physical Plant should review the funding for repair and maintenance activities to establish realistic operating budgets and utilize available funds to address the deferred maintenance problem.

- Control of the fuel and utility operating accounts should be administered separately from other Physical Plant operating accounts.

Our discussion of the budget process has concentrated on some specific concerns. However, these issues may be indicative of more general concerns with the University budgeting process. Although the University attempts to develop realistic budgets based on incremental changes from the prior budget, the growing list of deferred repair and maintenance indicates that the budgets may not be realistic over time. Similarly, the University policy allowing departments to manage budget surplus funds removes these funds from the scrutiny of the budget process. Although this policy does provide an incentive for departments to manage costs, the management of these funds on a decentralized basis may not be consistent with University objectives overall. We believe departments should be required to justify the use of these funds as part of the budget process.

C. RATES CHARGED FOR SERVICES

As discussed previously, Physical Plant charges approximately one-third of its costs to other departments. The rates used to charge other departments are established by Physical Plant staff. We found that:

- The central administration does not monitor or authorize the rates or level of Physical Plant charges to other University departments.

University departments, and Physical Plant in particular, have authority to administer their self-supporting activities, including the establishment of rates charged for services. The Board of Regents authorizes tuition charges, and a student services fee committee approves charges for student support activities. However, there is no independent authority that provides similar oversight for self-supporting activities. Without such an independent authority, the University does not have assurance that the fees being established by its departments are reasonable and consistent with objectives.

In our opinion, Physical Plant has too much independence in managing its financial operations. Unless costs charged to other departments are adequately controlled, Physical Plant could reallocate its own operating inefficiencies to departments. To improve accountability for charges to other departments, we recommend:

- Central administration should approve the billing rates developed by Physical Plant.

The Physical Plant rates include direct labor, materials, and some overhead. We have the following concerns with the methods used to calculate rates:

-- some administrative costs are not included in the rates;
-- certain salaries are not allocated equitably between jobs;
-- the markup for materials is arbitrary;
-- no provision exists for the cost of fixed assets; and
-- rates are not charged uniformly to all users.

We discuss these issues in the following sections.

1. Payroll and Administrative Costs

Payroll responsibilities are divided between the Physical Plant and the University Payroll Department. Physical Plant records time worked and allocates it to a funding source. The University Payroll Department generates warrants and verifies that all payroll costs are posted to the general ledger.

Physical Plant charges all administrative salaries and civil service workers' fringe benefits to its own budget. Physical Plant maintains the Daily Report Payroll system for allocating the payroll costs of trade workers, Teamsters, and other shop staff between its budget and the budgets of other departments. Direct labor charges are recorded for each job on time cards and shop tickets. Shop tickets are documents completed at the beginning of a job which identify the type of work, the location, and the funding source.

Certain indirect costs, such as general foremen and drivers salaries, paid breaks and vacation time, are not associated with specific jobs. Physical Plant generally adds a surcharge of approximately 33 percent to its direct labor costs as a means of allocating these indirect costs. All payroll costs are initially charged to payroll suspense accounts. The largest account is called Base Reserve. The information recorded on Daily Report Payroll is then used to reallocate both direct and indirect labor charges from Base Reserve to specific funding sources. Physical Plant adjusts surcharges when the amount recovered is more or less than the costs incurred.

We found that:

- The full cost of services provided to nonsupported buildings is not charged because administrative costs are excluded. In addition, current overhead rates do not equitably distribute costs.

Physical Plant does not charge other departments for the costs relating to its Administrative Control Division and the management salaries of other divisions. However, these costs are necessary to supply services, and should be allocated in order to recover the full cost of the job. Payroll is the largest component of administrative costs. For Fiscal Year 1987, unallocated payroll of the Administrative Control and Maintenance Divisions totalled $550,000 and $500,000 respectively.

Overhead allocations should be based on rational estimates and distributed fairly to each job. However, we found that some overhead components are not applied evenly to all jobs while others are not supported by any accounting records. We noted the following problems with certain of the surcharges included in the rates:

-- A surcharge is added to trade worker wages to recover the cost of drivers, but this surcharge is not added to wages of civil service workers who also use services of the drivers. Since the wages for the drivers are only recovered from trade worker jobs, the cost of these jobs is overstated. Physical Plant should allocate its costs to all jobs which use drivers, and not disguise high rates with an improper rate structure.

-- Civil service workers include grounds workers, laborers, equipment operators, and mechanics. Payroll for these workers is billed at actual wages plus a surcharge to recover holiday costs, sick leave usage, and vacation accrual. The surcharge allows for 180 holiday hours and 258 hours of sick leave and vacation accrual per year. The staff told us that the previous rate allowed for the

actual number of holiday hours earned (88), but the holiday account experienced a deficit. Therefore, the surcharge was increased until it was sufficient to cover holiday costs. The reason for the prior deficit was never determined. Physical Plant needs to recalculate this rate by estimating the liability for holiday, vacation, and sick leave, and allocating it based on estimated hours applied to jobs.

-- When grounds worker wages are charged to other departments, a 43 percent surcharge is added to cover fringe benefits, supervisory salaries, and supplies. This rate was established several years ago, and is assumed to still be accurate. The amount recovered from the surcharge is deposited back into a grounds care account. No existing accounting records support the amount of the rate or verify that recoveries were used to pay for the intended purpose.

-- The Custodial Division wanted to avoid fluctuations in the amounts charged to other departments resulting from differences in workers wages. In 1982, the division established a standard rate of $9.00 per hour which was based on the average wage of the workers, fringe benefits, and supplies. The rate has been increased to $14.00 per hour to account for the rise in wages. However, Physical Plant has not monitored the rate to verify that it is an accurate measure of cost. During Fiscal Year 1987, Physical Plant recovered approximately $300,000 from these charges. The amount recovered is deposited into the custodial account, and used in part to pay direct labor costs. The remainder is used to purchase equipment instead of funding the fringe benefits which the rate is intended to cover.

The full cost of Physical Plant jobs has been misstated because of inadequate overhead charges. As a result, the amounts not recovered have been funded from the Physical Plant operating budget. In addition, the overhead charges have not been fairly applied to user departments.

To provide for full recovery of all costs associated with individual jobs, we recommend that:

- Physical Plant develop a method to allocate administrative costs to individual jobs.

- The department review all payroll surcharges to ensure they are calculated based on proper estimates of current costs and are uniformly distributed to applicable jobs.

2. Utilities

The Heating Plant Operations Division is responsible for operating three heating plants, two in Minneapolis and one in St. Paul. The plants produce steam for the University and certain external users. The division also obtains all sewer and water, gas, and electricity services for the campuses from outside vendors. The vendors provide billings which separate charges by building for Minneapolis sewer and water services and gas services for both Minneapolis and St. Paul. Physical Plant has steam and electricity meters throughout the Twin Cities campuses and water meters in St. Paul which are read monthly. After the meter readings are reviewed for accuracy, billings are prepared to charge the

appropriate accounts based on usage. Utility costs relating to support buildings are charged to operating and maintenance accounts administered by the Heating Plant Operations Division. Except for St. Paul sewer charges, all costs relating to nonsupport buildings are charged to the appropriate accounts of other University departments. St. Paul sewer charges are paid from the Physical Plant budget.

The steam rates are calculated based on estimated heating plant costs. In the past, the steam rate would change every month based on the costs of producing steam. In July 1987, Physical Plant began using a standard rate that only changes twice a year. The rates are calculated by reviewing the prior year's operating statements and forecasting the next six months' expenses.

In our review, we found that:

- Departments on the Minneapolis and St. Paul campuses are charged different rates for steam.

For the period January to June 1988, steam produced at the Minneapolis plants was billed out to the University departments at $8.00 per 1,000 pounds of steam used. The rate used by the St. Paul plant was $6.25 per 1,000 pounds of steam used for the same period. The steam rates include all costs incurred to produce and distribute the steam at the plants such as direct labor, fuel, coal hauling, and ash hauling. The Minneapolis rate is higher than the St. Paul rate in part because it contains additional components, including an accumulated fuel and utilities deficit. Physical Plant estimates that the deficit should be recovered within ten years. The Minneapolis rate also includes an amount to recover the debt service expenses of the energy conservation project that began in the 1970's, known as Grid Connected Integrated Community Energy System (GRID ICES).

We question the equity of charging different rates for steam based on location of a department. Operating costs of individual heating plants may vary based on the overall efficiency of the facilities and past decisions regarding maintenance and repair. Basically, the users are all receiving the same service, provision of steam. We believe it would be more equitable to develop one steam rate based on total costs of the three heating plants.

We also found that:

- The add-on customers are charged lower rates for steam than University departments, resulting in lost revenue of approximately $262,000 in the last three years.

Fairview and St. Mary's Hospitals, and Augsburg College stopped operating their own heating plants and began purchasing steam from the University in December 1981 in an effort to conserve energy under the GRID ICES program. These entities, referred to as add-on customers, convinced the University to establish a constant rate for them, rather than the variable rate charged to the University departments. The add-on customers have been consistently charged a rate lower than the University departments on the Minneapolis campus. Currently the add-on customers are charged the rate in effect for University departments during the previous six months. For the three-year period July 1985 to June 1988, Physical Plant could have collected an additional $262,200 if the add-on customers had been billed at the same rate as University departments. The assistant director for the heating plants told us that there is no contract requiring the add-ons to be charged

a lower rate. Instead, the division did not want to raise the rates too fast because the add-on customers' budgets would not be able to handle it.

Until fiscal year 1983-1984 the Legislature fully funded the fuel and utility deficits of the University through a contingency appropriation. The add-on customers also benefited from this because the rates they were charged did not cover the full costs of steam usage. Consequently, we conclude that:

- The Legislature was unintentionally subsidizing fuel costs to private entities when it funded the fuel and utility deficits.

The add-on customers now question having to contribute to the current University fuel and utility deficits and do not want the deficit recovery amount included in their rate. However, it is appropriate to bill them for the deficit since the rates they were billed when the deficit occurred were not high enough to cover the heating plant's operating costs.

In reviewing utility rates, we also found that:

- The heating plant rates include an arbitrary depreciation amount.

Deterioration of the heating plant facilities is a significant concern to the University. Questions concern whether the current plants are capable of meeting University service demands, and how the replacement of the facilities will be financed. Renovating the two Minneapolis plants, including the purchase of two new boilers, could cost a total of $60 to $80 million. The total replacement of the three heating plants with one new facility could cost $150 million. Physical Plant increased its utility rates in an attempt to accumulate funds for facility replacement. However, due to the serious condition of the facilities, accumulated reserves currently are being used for repairs and maintenance of the heating plants.

During the last two fiscal years, Physical Plant has chosen to recover $1.5 million a year ($1 million for Minneapolis and $500,000 for St. Paul) for depreciation of the heating plants. The amount recovered is not based on the value of boilers and equipment or on estimated replacement cost. Because the boilers and equipment are quite old and depreciation was not included in prior billing rates, it would be impossible to attempt to collect prior depreciation in current billing rates. We agree that capital asset replacement should be considered when developing rates. However, the amount included in the rates should be based on an overall asset replacement plan which considers future funding sources. Reserves accumulated should be monitored to ensure they are used only for intended purposes.

In summary, we recommend the following regarding utility charges:

- Physical Plant should consider developing one rate for steam charges for both the Minneapolis and St. Paul campuses.

- The add-on customers should be charged the same rate for steam as the University departments.

- The components of the steam rates should be evaluated, primarily relating to accumulation of reserves for capital asset replacement.

3. Inventory Pricing

Material prices are determined by the individual shops. This has resulted in a wide variety of pricing methods. The refrigeration and plumbing shops, and the Transportation and Health Science tool cribs charge the most recent wholesale price for inventory, while the electric and pipe covering shops use the most recent retail price. The steamfitting and carpentry shops, and the St. Paul tool crib add a 10 percent markup to the current retail price because they must spend money to deliver and store items.

We concluded:

- The methods for pricing inventory items result in inconsistent charges to users.

Typically, the price of materials includes a markup to recover overhead such as office labor and shop supplies. However, current Physical Plant prices are not based on estimates of these indirect costs. As a result of its pricing methods, Physical Plant has recovered approximately $633,000 in excess of inventory costs. These amounts have accumulated over a number of years and remain in the inventory operating accounts. To date, there have not been any transfers to other accounts, which indicates that the inventory accounts are not being actively managed. However, Physical Plant intends to transfer approximately $372,000 to fund losses or insufficient recoveries of inventory costs from prior years. This transfer would leave aproximately $261,000 in available funds in the inventory accounts.

Physical Plant also accounts for used materials in inconsistent ways. The refrigeration shop includes used materials in inventory and charges them to jobs at 25 percent of the cost of a new item. The other shops do not charge used items to the jobs.

Physical Plant should develop a consistent policy for pricing inventory items. The policy should address both new and used materials.

We recommend:

- Overhead charges should be based on rational estimates of indirect costs and be used to pay their intended expenses.

- A plan should be developed for the use of the accumulated balances in the inventory operating accounts.

4. Fixed Assets

As of December 31, 1987 the historical cost or purchase price of Physical Plant's equipment totalled approximately $8.5 million. Table 2.4 provides a description of the areas in which these assets are located.

TABLE 2.4

PHYSICAL PLANT FIXED ASSETS
December 31, 1987

Administration	$ 246,000
Utilities	3,500,000
Repair and Maintenance	2,468,000
Custodial	710,000
Miscellaneous	1,576,000
	$8,500,000

Source: Property Accounting Equipment Inventory Report, December 31, 1987.

We found that:

- Physical Plant rates do not include a provision for renewal of fixed assets.

By not factoring equipment costs into its rates, Physical Plant is losing the opportunity to recover funds for equipment replacement. Thus, any new purchases must be fully funded from the Physical Plant operating budget. We were told that some prior rates did include a component for asset replacement and the reserves accumulated from these charges were used to start the used equipment program discussed in Chapter 6.

We recommend that:

- The rates charged to user departments should include a provision for the replacement of fixed assets.

5. Conclusions

Physical Plant charges user departments for the cost of operating "nonsupported" buildings. The current rates do not properly measure or allocate overhead costs. We believe that Physical Plant needs to revise the rates charged to user departments to fully recover expenses. The cost of the jobs would then be comparable to a private business providing similar services. It would also allow Physical Plant to build reserves for the replacement of its capital assets. Any reserves accumulated should be monitored to ensure they are used for intended purposes consistent with overall funding policy.

D. OTHER FINANCIAL CONCERNS

1. Personnel Issues

Physical Plant is organized under Mr. William Thomas, the Associate Provost for Physical Plant Operations. Mr. Thomas is also responsible for the University Personnel Department as the Associate Vice President for Personnel. The Personnel Department serves various functions relating to staffing and compensating civil service and Teamsters employees, but not for academic professional/administrative employees or trade workers. We believe that:

- Since one individual is in charge of both the University Personnel Department and the Physical Plant, his objectivity may be compromised regarding Physical Plant personnel matters.

Mr. Thomas was hired in January 1973 as the Director of Personnel. In August 1975, he was promoted to Assistant Vice President for Administration and Director of Personnel. His duties as Associate Provost for Physical Plant Operations were added in May 1986. It is unusual to combine the responsibilities for an operating unit with the personnel function. The Personnel Department is charged with ensuring the propriety of University personnel transactions. Because Mr. Thomas is extensively involved with Physical Plant matters, we are concerned with the possibility that normal personnel controls will be ineffective for Physical Plant.

The relationship between these two departments could allow the Associate Provost to reclassify employees to positions for which they were not qualified or to represent the Personnel Department in grievance hearings involving Physical Plant. We believe the University needs to revise its organizational structure to provide an independent review of Physical Plant personnel transactions. Currently, a representative of the Personnel Department is assigned specifically to Physical Plant to assist with personnel issues. One option to improve controls would be to have this position report to another department, thereby providing an independent review of Physical Plant personnel transactions.

Another concern regarding Physical Plant's personnel process relates to employee performance evaluations. Although meetings were held with assistant directors and other employees to discuss progress in meeting established objectives, we found that:

- The Physical Plant assistant directors were not given written performance evaluations at the time of their last salary increases.

The assistant directors received salary increases in July 1988. The increases are supposed to be based on performance. However, the assistant directors did not receive written performance evaluations. Three assistant directors belong to the academic professional/administrative plan while the others belong to the civil service managerial plan. University professional/administrative staff policies require written performance evaluations annually. The director told us that a new evaluation system is being developed, but it was not completed at the time of the increases. If salary increases are based on performance, we believe that the employee should receive a written evaluation to support the increase.

To improve Physical Plant's personnel process, we recommend that:

- The University should reorganize duties so that the Associate Vice President does not have responsibility for Physical Plant personnel issues.

- Physical Plant assistant directors should be given annual written performance evaluations at the time of their salary increases.

2. Inventory Controls

Physical Plant maintains an inventory of repair parts, materials and custodial supplies. Items used routinely in Physical Plant projects are kept on-hand so that work can be performed without delay.

Most of the repair parts and materials are under the control of the Maintenance Operations Division. Responsibility for the inventory is divided between its 18 shops. Other inventory centers include the Transportation Division, which operates a tool crib of small sensitive items, and the Health Science Maintenance Operations Division which maintains items for the health science research buildings. The St. Paul Operations Division controls the inventory for the St. Paul campus. As of January 1987, when physical inventory counts were performed, the value of inventory at these centers was approximately $1.6 million.

The Custodial Division stores supplies in approximately 35 inventory centers throughout the Minneapolis and St. Paul campuses. Supplies are issued from the centers to approximately 600 custodians. The amount of inventory is unknown because no perpetual inventory records exist and the division has not taken a physical count.

Some of the financial concerns associated with inventory include safeguarding the inventory from loss or theft, ensuring an optimum level of inventory to avoid stock outs or excessive storage costs, and obtaining purchase or quantity discounts, if available.

In June 1986 the University Internal Auditor issued an audit report[3] which contained specific recommendations to improve controls over Physical Plant inventories. The report found a lack of inventory control in the Minneapolis, St. Paul and Health Science shops and noted the following weaknesses: lack of perpetual inventory records, wide access to stock, and the inventory of many small parts where the cost effectiveness of controls becomes questionable.

The department manages a large volume of small dollar items in numerous locations and it may not be cost effective to maintain elaborate inventory management systems. Safeguarding of items is also more difficult when the inventory is stored in numerous locations such as the maintenance shops and custodial inventory centers. Despite these difficulties, we believe inventory controls must be improved significantly.

We reviewed internal controls at seven of the Minneapolis shops, two St. Paul shops, and the Transportation and Health Science tool cribs.

We found four weaknesses with inventory controls. First,

- Inventory recordkeeping is inadequate.

Physical Plant relies on the shop managers to control and report inventory usage. However, the only inventory records currently maintained are annual physical counts except

for the St. Paul tool crib where perpetual records are maintained. The physical counts do not help management detect shortages or monitor purchasing and usage because the inventory balance is provided only once during the year.

Most of the Physical Plant divisions cannot detect theft or unrecorded issuances because they do not have records to compare to the physical counts. A perpetual inventory system would enable Physical Plant to detect misuse of items, and to strengthen controls. Perpetual records could be compared to the annual physical count to detect shortages.

Management could also use perpetual records to monitor purchasing and usage. A computerized system could be programmed to identify inventory shortages or obsolete items. The system could also calculate the average price of the current inventory which would help Physical Plant allocate costs.

Physical Plant administration has identified the need for improved recordkeeping and plans to establish a central inventory system within the Transportation Division. In addition, the Minneapolis sheet metal, electric, plumbing, and steamfitting shops have begun developing inventory systems on personal computers. However, we do not believe it is economical for each division and the Physical Plant central administration to develop different systems. Physical Plant should assess the recordkeeping needs of each division and develop a uniform perpetual inventory system.

Second, we found that:

- The value of coal on hand at the end of the fiscal year is not verified.

The Heating Plant Operations Division keeps manual perpetual inventory records of the coal inventory at each plant. The records identify coal trucked to each plant, coal used in producing steam per month, coal received each month per invoices from the coal companies, and the prices of each load of coal received and used. As of January 1988, the coal inventory balance on these records was approximately $1.2 million. The heating plant staff feel that these manual records are an accurate representation of the coal on hand. However, the manual records cannot be reconciled to the amount shown on the University general ledger for fuel inventory. The fuel inventory account includes both coal and fuel oil purchases and usage. The heating plant accountant could not determine the reason for the differences. As a result, the general ledger may not represent an accurate value of fuel on hand. Physical Plant has been allowed to incur deficits in its fuel and utility accounts based in part on the value of its fuel inventory recorded on the general ledger. In addition, the general ledger accounts are the basis for external financial reporting. Therefore, accuracy of these accounts is important.

A third weakness of the inventory system is that:

- The inventory is not properly secured because access is not restricted.

Access to inventory should be limited to ensure that items are adequately safeguarded and issuances are properly recorded. The level of security depends on the nature of the inventory, but the risk of error increases with the number of people who have access to the materials.

The Transportation and St. Paul tool cribs restrict access so that the inventory is adequately secured. However, in the other shops, workers pick up their own materials, and Physical Plant relies on them to report the issuances of materials. In the Health

Science tool crib, the plumbing and carpentry trade workers have segregated some items in a locked area. The inventory custodian does not have access to this area. We see no reason why the trade workers should control this inventory.

When workers pick up materials, they should have authorization from their project supervisor, and the items should be issued by an inventory supervisor. Workers should then sign a document acknowledging receipt of the materials. Limiting access to the inventory would provide greater assurance that items are used for their intended purpose, and issuances are properly recorded.

A final inventory problem relates to division of responsibilities. We found that:

- Duties are not adequately segregated in the inventory centers.

In most shops the general foreman is responsible for inventory purchasing, and receiving. Good internal control requires that these duties be separated to ensure that purchases are used as intended.

Physical Plant could improve its procedures by assigning a person independent of the purchasing function to receive the goods, compare the quantity received to the purchase order, and deliver the goods to the inventory custodian. This would provide an independent verification that goods ordered were actually received by Physical Plant.

As discussed previously, physical counts could be compared to perpetual records to detect inventory shortages. In order for this to be an effective control, someone other than those in custody of the inventory should be involved in the physical counts. This would require a change in the procedures used by many shops, where the staff having custody of the inventory also perform the annual count.

Due to the variety of inventory items, it may be difficult for an independent person to perform the count. However, if someone totally independent of inventory custody accompanied the staff on their counts and spot-checked accuracy, the risk of intentional or unintentional errors going undetected would be decreased. This employee could also reconcile the counts to perpetual records, and investigate any differences. The Health Science Tool Crib is staffed with only one person so duties cannot be segregated. However, an independent person could periodically spot-check the accuracy of perpetual records and review purchases. This would provide a reasonable level of control.

In summary, we believe that improvements are needed in inventory recordkeeping and control. Physical Plant identified inventory control as a weakness when establishing divisional objectives in 1987. However, corrective action has not been completed.

To achieve these objectives, we recommend that:

- Physical Plant should develop a uniform perpetual inventory system for its divisions and shops, insofar as practicable.

- The manual coal records and yearly coal inventory calculation should be reconciled to the fuel inventory budget statement on a yearly basis.

- Access to inventory should be restricted, and requests for items should be authorized by the project foreman.

- Duties should be revised so that one person is not responsible for custody, purchasing, and receiving inventory items.

3. Purchasing

Physical Plant delegates purchasing decisions to its divisions. The divisions have adopted differing purchasing policies, but basically items are purchased as needed. We found that:

- Purchasing authority is too widely dispersed throughout the various divisions.

University procedures require that each department designate the individuals authorized to initiate and approve financial transactions. Physical Plant has identified at least three authorized signatories for most accounts. However, we cited several individuals not included on the authorized signature lists who were initiating purchases and approving invoices. In some cases managers from other divisions were signing for managers who were not available to authorize the transactions. This practice could allow managers to charge purchases to accounts controlled by another manager.

We noted that the assistant director for the Maintenance Operations Division had approved purchases for the Transportation and the Engineering and Planning divisions. Also, the assistant director for the Transportation Division had approved purchases for the Administrative Control, Engineering and Planning, and Maintenance Operations divisions. Similar examples were found for most of the other divisions. We also noted several cases where non-management staff who were not on the authorized signature list had approved purchases for their divisions.

Management personnel familiar with the accounts and responsibilities of each division are in the best position to determine that transactions are appropriate and being charged to the correct account. A central authority in each division should be designated to monitor purchasing requests.

Once purchases are made it is important to verify that all appropriate items are received and are in good condition before payment to the vendor is made. Our review indicated that:

- Receipt of goods is not properly controlled and documented.

The main Physical Plant building has a central receiving and dock area. However, the divisions do not use the area. Using the receiving dock would provide independent assurance that the goods are actually received. There are circumstances when items should be delivered to other locations, such as items ordered for specific jobs, boiler parts and coal. However, controls are strengthened if the number of delivery locations is minimized. Also, it is important to use packing slips or receiving reports to verify the receipt of goods. All packing slips and receiving reports should be matched with the invoices and purchasing documents before payment. We found that packing slips are not kept to document receipt of the goods. The Administrative Control Division requested that packing slips be attached to invoices, but this practice has not yet been implemented by any of the divisions.

To improve controls in the purchasing process, we recommend:

- Physical Plant should evaluate its authorized signature list for adequacy. Only those individuals included on the authorized signature list for each account should approve transactions.

- A centralized purchasing authority should be appointed for each division.

- The centralized receiving and dock area should be used for items received at the Physical Plant Shops building, insofar as practical.

- Packing slips or receiving reports should be retained for all purchases and compared to the invoices and purchasing documents.

4. Financial Information

Physical Plant has various types of financial information available for its activities. This information primarily is provided through the University's centralized accounting system. Several summary and detail accounting reports are produced from the University General Ledger accounting system. The Daily Report Payroll System generates many payroll reports. Physical Plant also maintains the Authorization Accounting System which accounts for costs charged to projects funded through authorizations. An authorization establishes the spending authority for major projects, usually costing more than $2,500.

In our opinion:

- The financial information system does not provide an adequate basis for management decision making.

The accounting information provided through the University General Ledger system has not been meaningful for Physical Plant management. In part this is due to the cumbersome and complex nature of the system. Various reports are produced each month showing income and expenditures to date. These reports provide information for approximately 160 individual accounts established by the department. There is little logic or consistency in the Physical Plant account structure. The primary basis for the account structure is funding source. Within each funding source, accounts are established based on function and type of activity. However, the accounting system does not identify the division responsible for administering the accounts. Therefore, it is difficult to analyze total financial activity for a division without manually recreating the necessary data.

Total costs associated with an activity often cannot be identified because, in accordance with University procedures, Physical Plant uses negative expense transactions to record recoveries or amounts charged to other accounts. While this may result in accurate information on expenditures for the University as a whole, it does not provide useful data for management to analyze the total costs of operating Physical Plant. Similarly, payroll costs lose their identity when processed through the Base Reserve account discussed previously. Normally, separate allotment or budget categories are established in each University account for salaries and fringe benefits. However, certain payroll costs processed through Base Reserve are classified as purchased services and included within supplies and expense budget categories rather than payroll.

The accounting system also does not provide meaningful information comparing budgeted and actual expenditures. Budget allotments recorded on the system include the original budget, any encumbered or free balances carried forward from prior years, transfers between

accounts, and closing entries. Therefore, for many accounts, year-end allotments equal actual expenditures plus outstanding encumbrances.

There are also problems with the financial information provided through Authorization Accounting and Daily Report Payroll. For example, expenditures relating to authorizations are recorded initially in a general account entitled Authorizations in Process. These costs are updated to the General Ledger accounts only twice a year or when authorizations are closed. As a result, expenditure totals for individual projects are often significantly understated on the accounting records. Also, some detail and summary reports produced from the Daily Report Payroll system are outdated or of little value to management. Further, Physical Plant retains computer files of the transactions supporting the Daily Report Payroll and Authorization Accounting systems for only a few months. This potentially valuable historical data could be used by management to provide more meaningful analyses and information relating to costs of individual jobs or by type of work performed.

Physical Plant management has recognized certain of these deficiencies with the centralized accounting system. The director, in his 1987-88 work objectives, identified the need for revised budgeting and expense tracking and development of a monthly operations budget report and detailed trial balance for the various divisions. The objectives stated that this would be completed by November 1, 1987. To date, this objective has not been met because of time delays in obtaining a comprehensive management information system. Operating statements are now prepared for the Heating Plant operations, but not for other divisions. Physical Plant has purchased various computers which will be used to process this information, but has not yet selected a software package to prepare the statements, although the director still considers this a primary objective. Similarly, the director of the Administrative Control Division established several objectives for 1987-88 to improve financial information. Many of these were to be completed by June 30, 1988. The objectives are in various stages of completion, in part waiting for implementation of the integrated accounting system discussed previously.

We believe that complete financial information is necessary for management decision making. Therefore, we recommend:

- Physical Plant should work with central administration to develop appropriate management financial information on the operation of all its divisions.

FOOTNOTES

[1]National Association of College and University Business Officers, *College and University Business Administration*, March 1977, p. 110.

[2]Other definitions of deferred maintenance exist. For example, the Association of Physical Plant Administrators (APPA) Deferred Maintenance Committee defines it as "labor and materials expended in periodic restoration of facilities that are deteriorating on time cycles of more than one year." The APPA definition emphasizes a means of systematically allocating future maintenance costs over several years. For our purposes, however, we use the term to mean the cost to correct the accumulated effects of not properly maintaining facilities.

[3]University of Minnesota, Department of Audits, *Physical Planning and Physical Plant Operations*, June 1986, p. 27.

OVERALL MEASURES OF ORGANIZATIONAL EFFECTIVENESS

Chapter 3

In recent years, top University officials have expressed concern about various problems within Physical Plant. They have recognized some of these problems to be deep-seated and difficult to address. Physical Plant's current top two administrators have been in place since 1986 and would like to make many changes in the department. Such changes will require an effective organization, so we asked:

- Does the department have logical reporting relationships and clear lines of authority?
- Has the department set objectives and made progress toward them?
- Do the department's management and operating divisions communicate well with each other? Does the department relate well with other units at the University and with the Board of Regents?
- Are employees satisfied with their jobs?

In general, we found that Physical Plant employees like many aspects of their jobs and that the department's management has taken positive steps toward organizing the department's work around stated, measurable goals and objectives. However, we also concluded that communication within the department and with external units needs significant improvement, recent reorganizations have not been particularly effective, and morale in the shops seems to be low.

A. DEPARTMENT ORGANIZATION

A department's ability to achieve its goals is enhanced by a logical organization and clear lines of authority. We examined Physical Plant's internal organization as well as its place within the larger organization of the University of Minnesota.

1. University Administration

Between 1984 and 1986, an Associate Vice President for Finance and Operations was responsible for a combined department of Physical Planning and Physical Plant Operations. In 1986, Physical Plant was separated from Physical Planning and put under a separate

Associate Vice President. A year later, responsibility for Physical Plant Operations was transferred from the Vice President for Finance and Operations to the Vice President for Academic Affairs. The Vice President for Academic Affairs is the Provost, or chief operating officer, for the University's Twin Cities campus. These changes were recommended in a 1986 report prepared by a national public accounting and consulting firm.[1] The consultant's premise was that systemwide functions of planning should be separated from campus-specific maintenance duties, and that the Provost should have responsibility for all support functions and budgets on the Twin Cities campus.

In our view, assigning Physical Plant to the Provost has not been a helpful change for Physical Plant. First, the Provost is primarily an administrator of academic functions and has not been expected to have expertise in the operation and maintenance of the University's buildings and grounds. Second, the Provost has very broad responsibilities, and the demands on the Provost's time are enormous. The Provost oversees all academic units on the Twin Cities campus, except those units reporting to the Vice President for Health Sciences and the Vice-President for Agriculture, Forestry, and Home Economics. Besides instructional activities, the Provost also oversees the libraries, university research centers, and academic personnel matters. In the past two years, the Provost has assumed important, time-consuming responsibilities for developing and implementing Commitment to Focus, the University's long-range plan for setting academic priorities. All of these important duties leave little time for attending to issues affecting Physical Plant.

2. Internal Organization

Physical Plant Operations has gone through several reorganizations since 1986, as well as numerous minor changes in assignment or responsibility. Figure 3.1 is a chronology of the more important changes.

In 1986, the department's organization was relatively compact: six division heads reported to the director. The current organization (as shown in Figure 1.2) has eight divisions headed by an assistant director, associate director, or a division manager reporting to the director. To limit the number of people reporting to the director, a ninth division head reports to the Associate Provost for Physical Plant. These divisions vary widely in size: the Custodial and Grounds Division employs more than 600 workers while the Environmental Operations and Engineering divisions are less than one-tenth that size.

The increase in the number of divisions is the result of dividing the Maintenance and Operations (shops) function four ways. There are separate divisions for shop operations in Minneapolis, St. Paul, and the Health Sciences complex, as well as a separate division responsible for engineering and planning. A fifth division, Transportation Services, is also largely responsible for Maintenance and Operations functions.

The Associate Provost for Physical Plant acknowledges that there are too many division heads reporting to the director. The situation results largely from top management's lack of confidence in the abilities of the associate director. Due to dissatisfaction with the associate director's performance, top management removed many of his responsibilities, including his supervision of the Minneapolis, St. Paul, and Health Sciences shops. Consequently, the shop division heads now report to the director. Thus, the awkward reporting arrangements in the organization stem from the under-utilization of the associate director's position.

FIGURE 3.1

CHRONOLOGY OF RECENT ORGANIZATIONAL CHANGES IN PHYSICAL PLANT

Fall 1986	Creation of Remodeling Division, initially with responsibility for Customer service center.
Early 1987	St. Paul Farm & Grounds Unit transferred from Institute of Agriculture to Physical Plant under Custodial and Grounds Division.
July 1987	Area managers hired for Minneapolis Shops.
January 1988	Elimination of Remodeling Division (also known as the Construction Unit) and creation of Transportation Services Division. Heavy equipment, vehicle maintenance (formerly in St. Paul Farm & Grounds) transferred from Custodial to Transportation Services Division. Customer service center transferred to Minneapolis Shops. Solid Waste, Hazardous Waste functions transferred to Environmental Operations. Maintenance & Operations Division under associate director divided four ways, headed by three assistant directors and the associate director. The four divisions: Minneapolis Shops, St. Paul Shops, Health Science Shops, and Engineering and Planning.
February 1988	Assignments for the Minneapolis area managers changed. Two new area manager positions added in St. Paul. One filled by transferring a manager from Minneapolis, the other by the former Farm & Grounds superintendent.
August 1988	Reorganization of Transportation Services Division, with certain staff from Minneapolis Miscellaneous Repair Shop transferred in.

Most Physical Plant managers and shop foremen we interviewed expressed strong concerns about the recent organizational changes, and these concerns fell into three categories. First, they were concerned that the changes were made without opportunities for them to offer ideas or comment on proposed changes. Second, once the changes were made, they were not communicated well to managers or employees. Most area managers and at least two division heads believe that they still have not been fully informed of the scope of their authority and responsibilities, such as whether or not they have actual budget authority. Managers also told us of instances where trade workers had copies of new organization charts before the area managers were notified of changes in personnel or responsibilities affecting them. Third, managers and staff expressed concern that changes occurred so often that they did not have adequate time to adjust to one organization plan and make it succeed before a new one was announced.

3. Shops

As we noted above, the shops are divided into five divisions, including separate divisions for Minneapolis, St. Paul, and Health Science shops. Although the division of the shops according to large areas of the campus is intuitively appealing, we found that the current arrangement is not genuinely a geographic split, nor is it a split along clear functional lines.

We found that the lines of authority in the shops operation are sometimes unclear, a situation that predates the recent reorganizations. For example, a general foreman in the Minneapolis campus electric shop supervises a sub-foreman on the St. Paul campus. The general foreman reports to a Minneapolis area manager and the Minneapolis division director. At the same time, that St. Paul sub-foreman also reports to an area manager and, in turn, a division director on the St. Paul campus. While the St. Paul director's budget authority probably settles most disputes over who is in charge, some workers told us this situation can be confusing.[2]

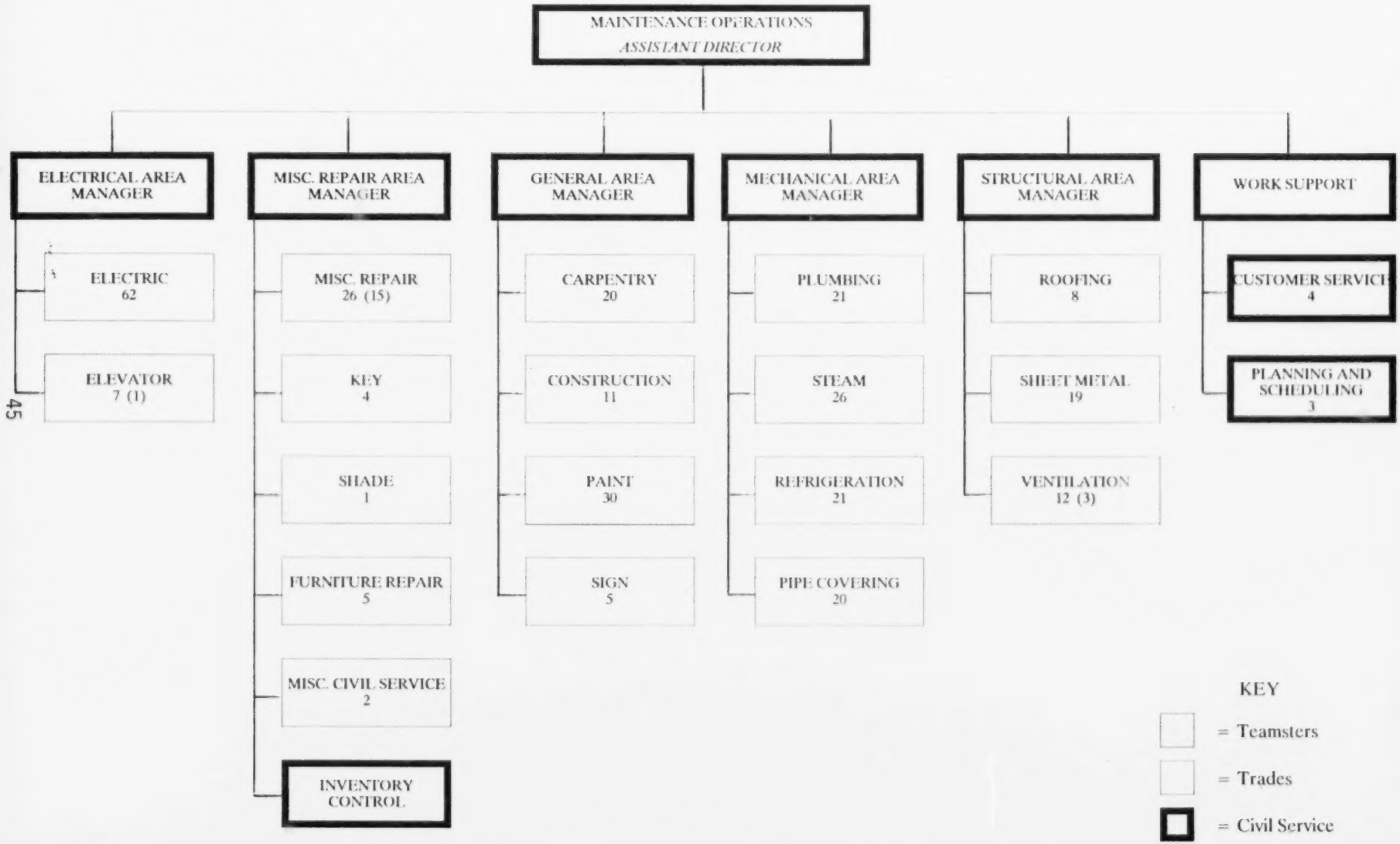
Figure 3.2 shows the organization of the Minneapolis shops. An assistant director supervises five area managers and a sixth manager for work support. The area managers are a new and controversial layer of supervision for the shops. They were hired as part of a larger plan to improve supervision and management of shop work and resources. The area managers, who are not members of trade unions, supervise trade union foremen, and this has caused some resentment in the shops. In the spring of 1987, the department asked the Board of Regents for permission to hire seven area managers, each to oversee one or more of the 18 shops. Some Regents disputed the need to insert a new layer of supervision over the general foremen in the shop. Eventually the Regents approved the area managers, but rejected a companion request to hire nine more people as planner-schedulers for the shops.

Physical Plant hired the area managers in July 1987. During their orientation they were given job descriptions that outlined broad responsibilities. They were also assured that they would have the tools needed to carry out those responsibilities, including secretarial and computer support, budget authority, and management systems.

In general, these plans have not been fulfilled. For the first nine months, area managers did not have offices, but only desks in an open arrangement in the shops building. They share secretaries with their shops and have experienced delays in getting computers. In most cases, they now share one computer terminal with their shops.

FIGURE 3.2

MINNEAPOLIS SHOPS
ORGANIZATIONAL CHART



NOTE: Staffing counts are as of 5/1/88. These numbers include health sciences trade shops numbers.

In our view:

- Area managers have not received adequate guidance of what is expected of them or support for their actions from division directors and Physical Plant's director.

As a result, some of them have gone their separate ways. For example, two managers, frustrated by the department's inadequate management information systems, each tried to modify commercial computer software to provide rudimentary information on shop tickets, work performed, and costs. They do much of the data entry and programming themselves. Other managers work on inventory systems or policy and procedure manuals, which have not been developed centrally.

We agree with the fundamental premise that staff are needed with responsibility for planning, scheduling and supervising shop work. (In Chapter 4, we analyze the department's performance in that area.) However, based on our interviews with area managers, foremen, and other department staff and our review of the activities of the area managers, we conclude:

- The area managers have not been used well.

They are not seen by employees or their supervisors as technical leaders, although three of the six area managers have engineering degrees. Even the more experienced managers have not received the authority, resources, or direction to function as real managers of day-to-day operations or as developers of objectives and plans for their shops.

4. Transportation Services Division

The Transportation Services Division was created in January 1988. Its functions include management and operation of heavy equipment, and maintenance and operation of vehicles. Since its creation, the Transportation Services Division has been characterized by unclear lines of authority, poor communications between management and staff, and conflicts among personnel.

The Associate Provost for Physical Plant has assumed responsibility for all important decisions about the division. In the past year, he has filled positions over the objections of the division head and the new area manager, has attempted to terminate a probationary employee despite a favorable recommendation from the division head, and has made other decisions about the make-up and organization of the division. These actions have caused resentment among the division's staff.

The action of the Associate Provost causing the greatest disruption was the reassignment of two individuals associated with the used equipment purchasing program, discussed in Chapter 6 of this report. They were reassigned to this division over the strong objections of the division head, who considers them unqualified for the positions they hold and disruptive to the smooth operation of the division. They have had numerous conflicts with other division personnel and with management and staff from other divisions.

Physical Plant managers and staff believe that the two individuals have tried to impose their views on others with the perceived support of top Physical Plant management. As a result, the staff's time has been wasted on squabbling, infighting, and efforts to undo

what somebody else has done. There is little evidence of a concerted effort to work together to achieve the department's goals.

5. Conclusions

We think the current organization of Physical Plant is awkward and makes effective management difficult. Dividing the maintenance and operations functions into five separate divisions means that there are too many division heads reporting to the director. It also results in inconsistencies in practice, as noted in Chapters 2 and 4. In addition, while arranging the shops based on large campus areas may make sense, the current organization of Minneapolis, St. Paul, and Health Science shops in three separate divisions is not truly a geographic organization.

Physical Plant's management should feel free to reorganize the department when such changes will improve operations. However, the changes must be accompanied by clear communication and well-defined lines of authority, and both seem to be lacking in Physical Plant's recent changes.

B. INTERNAL COMMUNICATION

We looked to see whether the top management at Physical Plant clearly communicates its goals and expectations to middle and lower managers and whether workers feel that they have an opportunity to present their concerns to management. Six out of eight division heads expressed concerns over communication between them and the director. For example, the Associate Provost and the director developed a Commitment to Focus document summarizing issues and problems affecting Physical Plant. Assistant directors were not consulted about the document, nor was the document shared with them.

In January 1988, after a reorganization, the director announced that he would hold bi-weekly meetings with the division directors. However, only a few such meetings have been held. One-half of the division heads told us that proposals or other requests sent to the director did not receive a timely response, or any response at all. Finally, we noted that several management positions lack job descriptions.

On a more positive note, the Associate Provost and director initiated year end review meetings with each division this year. At these meetings, the division directors and their assistants had an excellent opportunity to report on their accomplishments for the year and to present their concerns. We were generally impressed by the quality of the reports prepared by the divisions.

The department has taken steps in the past two years to communicate with workers on a regular basis. The Associate Provost has written and distributed periodic letters to all employees which provide information on developments in the department and also serve as a forum for the Associate Provost to address some of the recent controversies affecting the department. The Associate Provost has also initiated programs to recognize the service of longtime employees, including a dinner at which mementos were presented to veteran workers.

The Associate Provost is far more visible within the organization and outside it than the director of Physical Plant Operations. Perhaps because of the low visibility of the director, neither custodial nor shop workers feel that the director communicates well with workers. In the next section, we report the results of our employee survey. Besides dissatisfaction with communication from the director, workers also expressed concern about the lack of feedback from their immediate supervisors.

C. EMPLOYEE SATISFACTION AND MORALE

"Job satisfaction" is an individual's emotional response to his or her work or the work environment. In contrast, "morale" usually refers to workers' commitment to and satisfaction with the entire organization and its goals.

We see three reasons why employee satisfaction and morale might be important to Physical Plant's management. First, in some cases, employee satisfaction may affect productivity. while most research has suggested a weak relationship between satisfaction and employee performance or productivity, there may be special circumstances where employee satisfaction influences productivity.[3] Moreover, management may be better able to implement productivity improvements if it has the support, confidence, and trust of employees. Second, management should be concerned if employee dissatisfaction results in turnover or absenteeism. Third, because work is a central activity in the lives of nearly 1,400 people at Physical Plant, management should prefer happy workers to unhappy ones.

1. Results of Employee Survey

Early in our study, some Physical Plant workers raised concerns about the level of employee morale. We wondered whether the concerns expressed were isolated examples of employee dissatisfaction or representative of a widespread problem. To help answer this question, we developed a survey to assess individuals' (1) satisfaction with their jobs, and (2) pride in and satisfaction with Physical Plant. The instrument combined a standard job satisfaction survey developed at the University of Minnesota (the Minnesota Satisfaction Questionnaire) with questions which we devised specific to Physical Plant issues. We randomly selected about 480 full-time custodians and shop workers for the survey. Custodians and shop workers represent about 80 percent of workers at Physical Plant, and we chose to limit our sample to these workers due to resource limitations and the problem of finding survey locations convenient to other employees' work sites.

In May 1988, the University of Minnesota's Survey Research Center administered the survey in group settings to about 400 workers, or nearly half of Physical Plant's full-time custodians and shop workers. The samples were large enough for us to generalize about the attitudes of Physical Plant's shop and custodial work force with considerable certainty. Appendix A presents a copy of the survey and more detailed results.

We found that:

- The shop workers and custodians expressed somewhat lower levels of job satisfaction than similar workers in other organizations.

For about half of the survey questions, we were able to compare Physical Plant employee responses to those of custodial and maintenance workers in other organizations.[4] University officials questioned whether these comparison are valid since Physical Plant is an organization undergoing significant changes. We found that on a 100-point rating of general job satisfaction, Physical Plant custodians averaged about 69 and shop workers 71. On average, workers in other organizations had ratings of about 80. An author of the Minnesota Satisfaction Questionnaire reviewed our survey results and agreed that the level of Physical Plant job satisfaction appeared somewhat lower than is typical.

The survey revealed more variation in job satisfaction among the custodians than the shop workers. That is, compared to the shop workers, there are more custodians who expressed extreme satisfaction or dissatisfaction with their jobs.

We also asked employees whether Physical Plant is becoming a more or less satisfying place to work. We found that:

- More than 70 percent of shop workers think Physical Plant is becoming a less satisfying place to work. Only four percent of the shop workers said Physical Plant is becoming a more satisfying place to work.

In contrast, 23 percent of custodians said Physical Plant is becoming a less satisfying place to work, 25 percent said more satisfying, and 37 percent said Physical Plant is about as satisfying as it has always been.

In addition to reviewing overall levels of job satisfaction, we examined employee responses to specific survey questions. Tables 3.1 through 3.4 summarize key areas of employee satisfaction or dissatisfaction. Perhaps the most striking finding is that:

- Physical Plant shop and custodial workers expressed serious concern about Physical Plant management and supervision. The primary concern of shop workers is Physical Plant's top management (particularly the director and Associate Provost), whereas custodians expressed greater concerns about direct supervisors.

It is possible that the concerns about Physical Plant management reflect dissatisfaction with management policies rather than management style. For example, Physical Plant management initiated shop layoffs in 1986 and 1987 and increased the scrutiny of shop work by hiring area managers in 1987. University officials also told us that dissatisfaction with management might reflect racial biases, since Physical Plant's top two administrators are black in a predominantly white organization. However, we did not systematically examine the impact of race on employee attitudes, nor have University officials.

The following responses indicate important concerns about Physical Plant management:

-- Only 15 percent of shop workers and 36 percent of custodial workers expressed satisfaction with the way Physical Plant policies are put into practice. (It is unclear from this survey question whether workers are more dissatisfied with the policy implementation of top managers or lower-level supervisors.)

-- Of employees expressing an opinion, only 4 percent of shop workers and 26 percent of custodians said that Physical Plant's director "often, usually, or always" communicates effectively with employees. Of employees expressing an opinion, 13 percent of shop workers and 53 percent of custodial workers said that Physical Plant's director does his job well.

TABLE 3.1

PRIMARY SOURCES OF PHYSICAL PLANT JOB SATISFACTION[a]

Custodians	Percent of Employees Who Are Satisfied	Shops	Percent of Employees Who Are Satisfied
1. Physical Plant has steady employment	93%	1. Physical Plant has steady employment	91%
2. Chance to work alone	82	2. Chance to do different things	89
3. Ability to keep busy	82	3. Chance to work alone	87
4. Chance to try my own methods	74	4. Ability to keep busy	86
5. Chance to do different things	74	5. Chance to do things for other people	83

Source: Office of the Legislative Auditor survey of 211 shop workers and 184 custodians, May 1988.

[a]Based on 20 job satisfaction indicators in the Minnesota Satisfaction Questionnaire. The Physical Plant survey contained 20 questions from the short form of this questionnaire.

TABLE 3.2

PRIMARY SOURCES OF PHYSICAL PLANT JOB DISSATISFACTION[a]

Custodians	Percent of Employees Who Are Dissatisfied	Shops	Percent of Employees Who Are Dissatisfied
1. Chances for advancement	40%	1. The way Physical Plant policies are implemented	65%
2. The way Physical Plant policies are implemented	37	2. The competence of my supervisor	33
3. The way my boss handles workers	32	3. The praise I get for doing a good job	29
4. The praise I get for doing a good job	29	4. The way my boss handles workers	28
5. The competence of my supervisor	28	5. Chances for advancement	26
		6. Working conditions	23

Source: Office of the Legislative Auditor survey of 211 shop workers and 184 custodians, May 1988.

[a]Based on 20 job satisfaction indicators in the Minnesota Satisfaction Questionnaire. The Physical Plant survey contained 20 questions from the short form of this questionnaire.

TABLE 3.3

PHYSICAL PLANT SURVEY TOPICS
ON WHICH EMPLOYEES MOST FREQUENTLY ANSWERED
"SOMETIMES, RARELY, OR NEVER"

Custodians	Percent of Employees Who Answered "Sometimes, Rarely, or Never"	Shops	Percent of Employees Who Answered "Sometimes, Rarely, or Never"
1. Uniforms are comfortable and fit well	54%	1. The Physical Plant director communicates effectively with employees	83%
2. The Physical Plant director communicates effectively with employees	53	2. The Physical Plant director does a good job	71
3. People at Physical Plant work toward common goals	46	3. My direct supervisors inform me about the quality of my work	55
4. My direct supervisors care about me	42	4. People at Physical Plant work toward common goals	45
5. I look forward to coming to work	42	5. Direct supervisors make their expectations clear	42
6. My superiors try to address concerns I have about my job	40	6. My superiors try to address concerns I have about my job	41

Source: Office of the Legislative Auditor survey of 211 shop workers and 184 custodians, May 1988.

TABLE 3.4

PHYSICAL PLANT SURVEY TOPICS
ON WHICH EMPLOYEES MOST FREQUENTLY ANSWERED
"OFTEN OR ALWAYS"

Custodians	Percent of Employees Who Answered "Often or Always"	Shops	Percent of Employees Who Answered "Often or Always"
1. I'm proud of my daily work	77%	1. Our work is as good as that done by private contractors	95%
2. Our work is as good as that done by private contractors	76	2. I'm proud of my daily work	85
3. I know who to see about safety concerns	75	3. My schedule and workload are reasonable	82
4. My workplace is safe	72	4. I look forward to coming to work	73
5. I have proper equipment and supplies	72	5. I'm proud to work for the University	69

Source: Office of the Legislative Auditor survey of 211 shop workers and 184 custodians, May 1988.

In addition, we asked employees what two changes they would like to make at Physical Plant and gave them an opportunity to make other comments. The most common concerns raised by shop employees were: (1) dissatisfaction with the 1987 hiring of area managers for the shops, and (2) dissatisfaction with top Physical Plant management, usually the director or the Associate Provost. The shop workers expressed many other general concerns about management, frequently citing the lack of communication or employee participation in decision making. Among custodians, the lack of management communication was the fifth most common concern.

In addition to concerns about Physical Plant's top management, the survey also revealed significant concerns about direct supervisors. Seven survey questions provided information on various aspects of supervision, such as the responsiveness of supervisors to employee concerns and the extent to which supervisors make expectations clear. From these questions, we found that:

- More Physical Plant shop and custodial workers are satisfied than dissatisfied with their supervisors. However, for each aspect of supervision we examined, 30 to 40 percent of the work force expressed dissatisfaction.

The survey highlighted several areas in which there is room for Physical Plant shop and custodial supervisors to improve. For example:

-- Supervisors need to communicate better with employees. About 40 percent of Physical Plant workers said that supervisors "sometimes, rarely, or never" make expectations clear to them. In addition, 40 percent of custodians and 54 percent of shop workers said that supervisors "sometimes, rarely, or never" inform them about the quality of their work. Thirty percent of Physical Plant workers expressed dissatisfaction with the praise they receive for doing good work.

-- Supervisors need to be more responsive to workers' concerns. Forty percent of workers said that their supervisors "sometimes, rarely, or never" respond to expressed concerns.

-- Nearly one-third of Physical Plant workers expressed dissatisfaction with the overall competence of their supervisors.

Although custodians and shop workers usually expressed similar levels of satisfaction and dissatisfaction with their direct supervisors, custodians placed supervisory improvements higher on the list of changes they would like to see at Physical Plant. They cited problems such as supervisory favoritism, unequal enforcement of rules, and the lack of supervisory training.

We made several other observations about employee satisfaction and work attitudes from the survey. These included the following:

- Shop workers generally find their work more challenging than custodial workers. Eighty percent of shop workers feel satisfied that Physical Plant makes use of their abilities, compared to 58 percent of custodians. About 74 percent of shop workers "often, usually, or always" look forward to coming to work, compared to 56 percent of custodians.

- A large number of Physical Plant employees (45 percent) believe that people at Physical Plant "sometimes, rarely, or never" work together toward the same goals.

- The most satisfying characteristic of most Physical Plant jobs is the steadiness of the work. Table 3.5 shows other things that employees said they like about working at Physical Plant.

- Most custodians expressed some concerns about their uniforms, which they think are hot, uncomfortable, or poor-fitting.

- About 37 percent of shop workers expressed dissatisfaction with workplace safety, compared to 19 percent of custodians.

TABLE 3.5

THINGS THAT EMPLOYEES LIKE MOST ABOUT WORKING FOR THE UNIVERSITY OF MINNESOTA'S PHYSICAL PLANT[a]

	Percent of Custodial Workers	Percent of Shop Workers
The work is steady	75%	69%
The pay is good	61	38
Quality of work is good	17	49
Organization is well-managed	7	1
There are new challenges daily	6	24
It's rewarding to maintain an important place like the University of Minnesota	35	33
I like the people I work with	35	33

Source: Office of the Legislative Auditor survey of 211 shop workers and 184 custodians, May 1988.

[a]The totals exceed 100 percent because workers could choose up to three responses.

Overall, the survey indicated that there is room for improvement in Physical Plant employee job satisfaction. Custodians have more concerns than shop workers about the nature of their jobs, such as the lack of opportunity for advancement and the lack of new challenges. In contrast, the shop workers expressed more concerns about Physical Plant management and the general direction of the department. We think these latter concerns are evidence of a "morale" problem within the shops that goes beyond mere job dissatisfaction. As noted earlier, "morale" differs from job "satisfaction" in that it reflects (1) the consistency of workers' goals with the goals of the organization, and (2) pride in the organization as a whole, not just one's own work performance.

From our discussions with workers, it appears that some of the employee concerns reflect a disagreement with management policy, not just the way it is put into practice. Also, it is clear from interviews and survey comments that many workers perceive that Physical Plant's director and Associate Provost lack adequate technical backgrounds, a perception we think is unfair. Nevertheless, regardless of its cause, the lack of rapport between management and workers threatens management's ability to make organizational changes and produces a working environment that benefits neither group.

2. Absenteeism and Turnover

The amount of absenteeism and turnover in an organization are sometimes indirect indicators of employee satisfaction or morale in an organization. Unfortunately, the information available from Physical Plant on these indicators is not particularly helpful, nor are there clear standards against which to compare absenteeism and turnover.

Over a 10-month period in 1987 and 1988, sick leave represented about 3.7 percent of total custodial work hours. During the same period, employees in Physical Plant's Teamster shops used sick leave 3.9 percent of the time.[5] Trade workers only receive sick leave in the case of extended illnesses, and Physical Plant maintains no central records of sick time among these workers.

Physical Plant also maintains no central records on turnover among trade workers. A report by the University's Personnel Department indicates that 76 building and grounds workers voluntarily terminated between July 1985 and April 1988.[6] This strikes us as a relatively low rate of turnover in a division with about 600 employees.

D. EXTERNAL RELATIONSHIPS

For Physical Plant to operate effectively, it needs to maintain close working relationships with some other parts of the University of Minnesota. Early in our study, we identified three organizations that have important but troubled relationships with Physical Plant, and we examined these relationships in more detail. This section examines Physical Plant's relationship with the Board of Regents, the Office of Physical Planning, and the Department of Environmental Health and Safety.

1. The Board of Regents

To evaluate this relationship, we interviewed Physical Plant's top management, eight of the twelve Regents, and the University's interim President. We also reviewed minutes of Regents meetings for the past three years.

We found that the Regents' Physical Planning and Operations Committee devotes most of its time to consideration of proposed University construction projects rather than ongoing building maintenance issues. This is not unexpected, since the Regents must approve projects estimated to cost more than $100,000. There have been several important Regent discussions related to Physical Plant in the past three years, including the following:

-- In 1986, the Regents reviewed Physical Plant's agreement with the Minnesota Building Trades Council, which Physical Plant negotiated following an inquiry by one of the Regents about the lack of a trades contract.

-- In 1987, the Regents approved Physical Plant's request to hire area managers, but denied a request to hire planner-schedulers.

-- In 1988, the Regents had extensive discussions on cost overruns for remodeling work at the University President's home. While Physical Plant did only a small part of the remodeling work in this case, the incident prompted the Regents to discuss the need for an outside evaluation of Physical Plant management.

-- In 1988, Physical Plant management discussed the University's internal audit of its used equipment purchase program with the Regents.

-- In 1988, Physical Plant management gave a tour of its facilities to Regents and discussed deficiencies in work space and other Physical Plant issues. To Physical Plant's credit, the tour and discussion were well-organized and informative. To the Regents' credit, attendance and interest were both high.

As to the nature of the relationship between Physical Plant and the Regents, we found that:

- Physical Plant's top managers expressed concern about the Regents' reluctance to come to them for information.

- The Regents distrust the current Physical Plant administrators and expressed a desire for better information from them.

The contacts between the Regents and top Physical Plant administrators have been limited mainly to formal meetings of the Regents. Physical Plant's director told us that no Regents have contacted him with questions since his appointment in 1986. Top Physical Plant administrators feel that the Regents talk more to lower level staff in Physical Plant than to them. In addition, we learned that University protocol inhibits Physical Plant administrators from initiating direct contacts with Regents. The administrators usually must obtain direct approval from their superiors (including the University President) before contacting Regents, and then all contacts are made with the chair of the Physical Planning and Operations Committee. This rather formal process may discourage frequent contact between Physical Plant and the Regents, and it limits Physical Plant management's ability to improve the relationship on its own.

It is also clear from our interviews that the Regents distrust Physical Plant's current top management. Some feel that the administrators' presentations have been misleading or unfocused. Others believe that the administrators have been ineffective in solving Physical Plant problems or creating a positive work environment.

While the Regents' lack of trust may be a key problem in their current relationship with Physical Plant administrators, it is also clear that:

- Previous Physical Plant administrators have not informed the Regents about the condition of important University facilities.

The most obvious example is Physical Plant's failure to inform Regents about the deficiencies of the University's heating systems in the past decade. The University of Minnesota has 14 boilers that generate steam for heating and cooling campus buildings. Several of the boilers have reached the end of their useful lives, and the University has not added sufficient boiler capacity to keep pace with recent construction on the Twin Cities campuses. Consequently, if a boiler breaks down during the winter, Physical Plant might not be able to meet the University's heating needs. Also, buildings at the end of the steam lines (including two Minneapolis hospitals) do not always have enough steam pressure, resulting in inadequate heat. Breakdowns in the University's heating system could destroy research projects and threaten animal and human life.

Several of the Regents we interviewed said they were unaware of the heating system's poor condition until 1987, when Physical Plant made a $28 million request for a new boiler and other improvements. Until recently, Physical Plant administrators have not built up reserves for eventual replacement of boilers, nor have they explored alternatives to the current heating system.

Clearly, the Regents have some valid reasons for their dissatisfaction with Physical Plant managers, and we think Physical Plant managers and top University administrators need to try much harder to develop a more healthy relationship with Regents. Meanwhile, Regents should solicit Physical Plant input and encourage public discussion of major Physical Plant issues. The problems we have identified in our report will need the persistent attention of not only Physical Plant managers but also the Board of Regents.

We should not close this section without discussing another aspect of the relationship between Regents and Physical Plant. There is a significant division among Regents over how their concerns with Physical Plant should be pursued. Members of the Regents' Physical Planning and Operations Committee, as well as other Regents we talked to, are sharply divided over the appropriateness of individual Regents intervening in the operation of Physical Plant in an effort to influence specific management decisions.

Some Regents feel that it is appropriate for them to individually pursue specific concerns about the operation of the Physical Plant whatever way they choose. They say that they typically react to information they receive from Physical Plant employees and pursue additional information and action because they believe the problems that are brought to their attention are not being properly handled.

It is hard to criticize Regents for such dedication to duty, particularly since they have been recently criticized for not adequately overseeing the management of the University. Therefore, we think that the answer is not for Regents to pursue their concerns less vigorously. Rather, they should share them with their fellow Regents in public meetings and pursue solutions through the collective decision-making procedures of the Board and its established committees. The Board of Regents should in fact develop policies and procedures to guide Regents in pursuing specific concerns about University operations.

Regents are elected by the Legislature because of their individual qualifications. They are expected to have strong views about the operation of the University, and there is even some implication that they are expected to represent certain constituencies. Nevertheless, we think that sound governance of the University calls for Regents to focus primarily on University-wide interests and to pursue them as members of a collective decision-making body. Differences of opinion and perspective are to be expected and should be fully brought forth. But ultimately the Regents need to set policy to give

managers of Physical Plant clear and consistent direction. When Regents act individually to try to influence Physical Plant management decisions they limit the opportunity for other Regents to participate in the process and risk confusing management over what direction is expected.

2. Office of Physical Planning

The University of Minnesota's Office of Physical Planning is responsible for ensuring that new construction or renovation of existing campus buildings supports the overall objectives of the University. For each of the University's campuses, the office plans (1) campus land uses, (2) the efficient movement of people, vehicles, and materials on campus, and (3) the design and use of buildings.

Created in 1972, the Office of Physical Planning was originally a separate unit from Physical Plant Operations. But in 1984, the Associate Vice President for Physical Planning was given responsibility for the Twin Cities' Physical Plant Operations. Some staff from these departments told us that the merger initiated a closer working relationship between the departments. Others felt the merger made little difference.

As noted earlier, a 1986 consultant's report resulted in a separation of Physical Plant from Physical Planning. We interviewed managers and staff in both Physical Plant and Physical Planning to find out what their relationship has been like since the separation. We found that:

- By all accounts, the relationship between Physical Plant and Physical Planning has been strained, particularly at higher levels of the organizations.

Several examples illustrate this. First, Physical Plant and Physical Planning disagreed in late 1987 about Physical Plant's proposed Construction Unit for remodeling work (discussed in Chapter 6). Physical Plant officials wanted to restrict Physical Planning's oversight of remodeling done by Physical Plant workers, an issue that continues to divide officials in the two departments.

Second, many Physical Plant staff believe that Physical Planning does not adequately consider maintenance concerns when it designs new buildings. They believe that closer involvement of Physical Plant in discussions about building design could reduce future maintenance costs. Physical Plant staff also feel that Physical Planning has not considered the effects of new construction on the University's steam distribution system (which is near capacity) and that Physical Planning holds private contractors to standards that are too low.

Third, Physical Planning's Director of Engineering and Architecture did not learn until April 1988 that Physical Plant had created its own Engineering and Planning Division more than four months earlier. Although these two units do not appear to overlap, the lack of communication resulted in confusion about roles and suspicions in Physical Planning about Physical Plant's intentions.

Despite the lack of a good working relationship between top department officials, we think there has been some limited progress between the staffs on common issues. In particular, Physical Planning has made some recent efforts to see that Physical Plant has more opportunity for input into construction projects. For example, during 1988 Physical

Planning has sent copies of "building programs" for upcoming construction projects to Physical Plant, which include schematic designs of proposed projects. Also, Physical Planning is currently updating its standards for design and construction, and suggestions made by Physical Plant staff have been incorporated.

3. Department of Environmental Health and Safety

Physical Plant employees encounter many potential hazards to health and safety. These include the cleaning supplies used by custodians, the asbestos removed from buildings by shop workers, and the hazardous wastes produced in University research and disposed of by Physical Plant workers. In our survey of Physical Plant custodians and shop workers, about one-fourth said that their workplace and working conditions are "sometimes, rarely, or never" safe.

The University of Minnesota's Department of Environmental Health and Safety (DEHS) advises University units on health and safety policies and procedures, based on regulations promulgated by the state Occupational Health and Safety Administration (OSHA).[7] It is the responsibility of Physical Plant managers and supervisors to implement safety policies and procedures.

We found that:

- There is poor communication and cooperation between Physical Plant and the Department of Environmental Health and Safety.

State OSHA officials made at least 14 visits to Physical Plant in the past three years. OSHA officials we talked to said this is an unusually high number of visits. They attributed this to the lack of cooperation between DEHS and Physical Plant, which resulted in fewer internally-resolved safety issues.

Our interviews with University staff indicated unclear lines of authority and personality differences between the staffs of Physical Plant and DEHS. Physical Plant has not implemented comprehensive health and safety policies and procedures, nor has it responded to DEHS' "periodic loss control reports," which suggest ways to reduce accident rates. Physical Plant management contends that DEHS health and safety information is often poorly organized or incorrect. Overall, DEHS staff estimated that Physical Plant implements their recommendations in a timely manner about one-half of the time. In the remaining cases, Physical Plant managers told us they disagree with the recommended policies or methods, or lack the funds to make changes.[8]

There are serious risks associated with the lack of cooperation between Physical Plant and DEHS. For example, DEHS advises departments to properly identify hazardous materials stored in buildings in case of fire. According to DEHS, when firefighters entered a burning Physical Plant storage facility in 1987, Physical Plant had not alerted DEHS to the potentially dangerous contents stored there temporarily. Although most of the problems in the Physical Plant/DEHS relationship have occurred below the level of the department directors, the current relationship requires more active attention by the departments' top officials.

E. ACHIEVEMENT OF OBJECTIVES

Effective organizations usually have clear goals and regularly review progress toward them. This is especially important in organizations undergoing changes, such as those outlined by Physical Plant's management in the past two years. We found that:

- Physical Plant management instituted a "management by objectives" program in 1986, providing both direction and performance measures for division heads.

Each year, division directors develop lists of objectives for the next 12 months. During our many interviews with Physical Plant staff, we discussed progress on most of Physical Plant's 1987-88 objectives. In some cases, Physical Plant managers achieved or made significant progress on important objectives. For example:

-- Physical Plant initiated an evaluation of its heating system to determine the life expectancy of University boilers and funding requirements for the system. This analysis is not yet completed, but it is long overdue and Physical Plant's current management deserves credit for giving attention to the heating system.

-- In accordance with objectives, Physical Plant established a computerized system to produce operating statements for the heating plants.

-- Physical Plant recently completed a draft of its first personnel policy and procedures manual. It will be issued to employees later this year.

In contrast, Physical Plant made little progress toward some of its other objectives in the past year:

-- Physical Plant has not developed or implemented a formal program of employee and supervisor training. Based on responses to our employee survey, there seems to be much room for improvement in Physical Plant's supervisory skills.

-- The Transportation Services Division has not yet evaluated the vehicle repair operation against performance standards.

-- In accordance with objectives, Physical Plant developed a preliminary list of time standards for maintenance jobs. However, there has been little progress toward testing and implementing these standards in the shops, as Physical Plant's managers had hoped.

One of Physical Plant's failures has adversely affected several aspects of the organization. Specifically:

- In our view, Physical Plant's chief failure in 1987-88 was its inability to make progress toward the implementation of a computerized maintenance management and accounting system.

A "maintenance management system" is intended to improve management's oversight of labor productivity, materials inventory, equipment use, and budgets, and will be used by Physical Plant's shop, custodial, transportation, and financial managers. According to the 1987-88 objectives, Physical Plant's director originally wanted to purchase this system by November 1987.

In 1987, Physical Plant's associate director proposed awarding a contract to a local vendor without going through a competitive proposal process. The associate director had assurances from his superiors that the project could proceed on this basis and would not be subject to review by the University's Management Information Steering Committee. This committee reviews major computer hardware and software acquisitions by University departments. However, after University purchasing officials questioned why the steering committee had not reviewed the document, Physical Plant submitted its proposal to a member of the committee. The member reviewed it and asked Physical Plant to redraft the proposal and circulate it to other qualified vendors.

Physical Plant submitted a request-for-proposal to the committee member in January 1988, but he also returned this document with a request to improve its clarity and Physical Plant's assessment of computer needs. After all this, the department used reserve funds to buy $175,000 of computers, to be used largely for word processing.

Thus, it appears that both the approval process and the substance of Physical Plant's request-for-proposal were flawed. Originally, top management incorrectly believed that the MIS Steering Committee could be bypassed, and the committee later raised valid criticisms about the document submitted.

A final observation is that Physical Plant's reorganization in December 1987 left responsibility for certain tasks unclear. For example, the associate director developed objectives for Physical Plant's shops, including implementation of the maintenance management system, work performance standards, and training programs. However, after management reassigned the associate director to a new division, there was little progress toward these objectives.

After discussing progress toward objectives with each of Physical Plant's directors, we tried to summarize Physical Plant's record of achievement. We recognize that management by objectives is new to this department, and some objectives (such as those in the Heating Plant Division) may have been unrealistic. Also, top administrators may have set overly-ambitious objectives to encourage progress in an organization with deep-seated problems. While it is not our intent to discourage this ambition, we feel it is fair to comment on Physical Plant's achievements. Relatively few objectives were subject to outside contraints beyond the influence of Physical Plant managers.

Overall, we conclude that:

- Physical Plant's record of meeting its 1987-88 objectives is mixed, with some noteworthy accomplishments and failures. More often than not, there was progress toward objectives, although it was usually slower than that targeted in the written objectives.

Physical Plant's top management generally expressed satisfaction with the progress of their division heads for 1987-88.

F. CONCLUSIONS AND RECOMMENDATIONS

As noted elsewhere in this report, most of Physical Plant's problems stem from years of neglect and inactive management. These are not problems that will be changed rapidly. Physical Plant's current management deserves credit for its management by objectives program, which should help focus attention on department direction and performance.

At the same time, we do not think that Physical Plant is a particularly effective organization, despite many recent changes. Its organization is awkward, with too many people reporting to the director. There are three maintenance and operation divisions (which have two support divisions), and maintenance policies and procedures are often quite different from one location to the next. The associate director plays a minor role in top management, especially since a recent reduction in his responsibility. There is a lack of useful communication between the director and his division heads. There is also poor communication between Physical Plant and some related University agencies. There is inadequate trust and cooperation between the Regents and Physical Plant, which could inhibit progress on certain issues. Employee job satisfaction and morale have much room for improvement, largely due to concerns about management and direct supervisors.

These problems could be addressed in a variety of ways, and we think Physical Plant management should have an opportunity to think of creative ways to do so. For example, the director should be responsible for establishing better communication between himself and his senior staff, and there are probably not formal means of "mandating" this. However, at a minimum, we recommend the following organizational changes:

- Physical Plant should report to a vice president other than the Vice President for Academic Affairs and Twin Cities Provost. We suggest the Vice President for Finance and Physical Planning.

- The director should take the initiative to make himself more available to employees, particularly at times of major decisions (such as the decision to suspend remodeling work, discussed in Chapter 6). One way to do this would be to have periodic question and answer sessions with selected shops.

- The Board of Regents should develop policies and procedures to guide Regents in pursuing specific concerns about University operations.

FOOTNOTES

[1]Peat, Marwick, Mitchell & Co., "University of Minnesota Multi-Campus Decentralization Study: Physical Plant and Planning Position Paper," April 4, 1986.

[2]Some state and local building codes require master trade workers to supervise certain jobs. This contributes to these awkward lines of authority.

[3]Edwin A. Locke, "The Nature and Causes of Job Satisfaction," *Handbook of Industrial and Organizational Psychology*, ed. Marvin D. Dunnette, pp. 1332-1333.

[4]The Minnesota Satisfaction Questionnaire has "norms" which indicate how the typical worker in a given occupation responds to the survey. Although the norms for these comparison groups date back 20 years, job satisfaction survey experts told us that responses to such surveys generally have been consistent over time.

[5]Physical Plant Payroll Section, data for July 1987 to April 1988.

[6]University of Minnesota Personnel Department, "Number of Vacancies Filled and Turnover Statistics For the Period July 1, 1985 to April 12, 1988."

[7]DEHS reports to the Vice President for Student Development.

[8]Also, according to our interviews and observations, Physical Plant's internal health and safety committee lacks direction and focus.

PRODUCTIVITY AND COST-EFFECTIVENESS OF SHOPS

Chapter 4

Physical Plant Operations employs about 400 workers in 18 maintenance and repair shops. These shops maintain the structural condition and mechanical systems of University buildings. The largest shops are those that do electrical, steam fitting, refrigeration, plumbing, painting, and general repair work. This chapter examines a variety of issues that influence the productivity and cost-effectiveness of work done by Physical Plant's shops. We asked:

- How do the shops plan and schedule work?
- Are the shops accountable for work completed?
- How do the staffing practices of Physical Plant's shops compare to those at similar institutions?
- How do Physical Plant's work rules affect productivity?
- Does Physical Plant have an effective preventive maintenance system for equipment?
- How efficient is the system for transporting workers and materials to and from the job site?
- Do the shops perform high quality work?

To address these questions, we interviewed top Physical Plant managers, all of the area managers, foremen in 12 shops, and union business agents. We also administered an employee survey to a representative sample of shop workers. In addition, we contacted officials familiar with shop operations at institutions comparable to the University of Minnesota (other Big 10 schools, University of Minnesota coordinate campuses, and large private and public Twin Cities employers). We also reviewed available Physical Plant and national data related to staffing and productivity.

To help us address some technical issues discussed in this chapter, we hired two consulting firms. At our direction, one firm evaluated the shops' work quality, timeliness, work planning and scheduling practices, and staffing practices.[1] We selected a sample of 50 projects from six shops, as discussed in more detail in Appendix B. For each project, the firm visited the work site and interviewed appropriate supervisors or workers. They also observed foremen assigning work and examined work schedules. In addition, the consultant conducted general interviews with shop managers.

A second consulting firm evaluated preventive equipment maintenance activities.[2] As detailed in Appendix B, we asked the consultant to examine (1) a representative sample of all preventive maintenance activities done at the University, and (2) a representative sample of activities scheduled but not completed during a recent month. We wanted to know whether Physical Plant's preventive maintenance system was effectively managed, whether its schedule for preventive maintenance was appropriate, and whether Physical Plant's failure to do some activities on schedule put important equipment at risk. In addition to reviewing the schedules, the consultant inspected 50 pieces of University equipment and interviewed foremen and workers.

In general, we concluded that Physical Plant's shops do high quality work, but there are many improvements that could make the shops more productive and cost-effective. Physical Plant lacks a strong foundation of work planning and scheduling, which inhibits its ability to make staffing decisions and develop a more efficient transportation system. Physical Plant's shop workers are more specialized and highly-paid than workers at similar institutions doing comparable work. Formal and informal work rules affect the shops' productivity, particularly the policy prohibiting workers from driving themselves to work sites. Finally, Physical Plant's preventive maintenance system lacks central control or direction, and there are no useful means of evaluating the system's cost-effectiveness.

A. INTRODUCTION

1. Type of Work Done By Shops

Prior to doing maintenance or repair work, the shops must have a shop ticket describing the nature of the work to be done. Shop tickets are usually written by Physical Plant's Customer Service Center (which takes maintenance requests from University building users) or the shops themselves. Most of the 5,500 to 9,000 shop tickets completed each month fall into one of three categories:

(a) *Call-in and repair work.* This category includes work expected to cost less than $2,500, and it is usually done in response to a departmental request or a problem observed by Physical Plant workers.

(b) *Preventive maintenance (also called "computerized scheduled maintenance").* For the most part, this category includes cyclical equipment maintenance that shop workers do at regular intervals to prevent later repairs. Each month, a computer system automatically generates shop tickets for pre-scheduled preventive maintenance activities.

(c) *Authorizations.* For work estimated to cost more than $2,500, the shops must receive prior authorization from division heads, area managers, or project coordinators in Physical Plant's Work Support unit.

From a review of shop tickets completed in February 1988, we found that the shops spent about 57 percent of their time doing call-in repairs, 24 percent working on authorizations, and 19 percent performing preventive equipment maintenance. The type of work varies considerably from shop to shop. For example, the refrigeration and ventilation shops spend three-fourths of their time doing preventive maintenance, while the construction and paint shops spend most of their time working on authorizations.

2. Recent Indicators of Shops Productivity

A recent Commitment to Focus document prepared by Physical Plant management concluded that poor management of the shops prior to 1986 "led to an erosion of productivity that borders on being scandalous."[3] The document said that a conservative estimate of the shops' productivity was 20 to 25 percent. That is, employees spent less than one-fourth of their time doing "hands-on" work, with the rest of their time spent waiting for materials or assignments, going to and from jobs, setting up for jobs, or doing unproductive activities. This estimate was partly based on a much-publicized internal Physical Plant "study" of shops productivity, which found that the shops' productivity was 19 percent, compared to approximately 65 percent in a well-managed maintenance operation.[4] We found that:

- Physical Plant management's 19 percent shops productivity estimate was misleading and widely misinterpreted.

The study that produced the estimate was actually a survey completed by two Physical Plant managers and a plant engineer. The three participants answered 100 survey questions about the shops. For example, they estimated what percent of employees had written job descriptions, and they rated shop layouts as "ideal," "good," "fair," or "poor." While the answers to these questions highlighted many Physical Plant shortcomings, they provided no reliable basis for a precise estimate of productivity. A representative of the company that developed the survey told us that the survey serves mainly as a "teaser" for potential customers and is often followed by more direct observations of productivity in an institution.

A more comprehensive indicator of productivity and cost-effectiveness in the University of Minnesota's shops is a periodic cost and staffing report prepared by the Association of Physical Plant Administrators of Universities and Colleges (APPA). Although the APPA data is self-reported by universities and is only a gross indicator of productivity, it is the best available means of comparing universities nationwide.

The most recent national data indicated that:

- Compared to shops at other American universities, the University of Minnesota's shops were among the most heavily staffed and their workers were among the most highly paid in 1984-85.

An updated APPA report on costs and staffing will be released in late 1988. The 1984-85 report showed that the University of Minnesota employed 456 "building maintenance" workers, more than any other institution reporting (Purdue was second with 307). To adjust for campus size, we computed the maintenance cost per square foot, as reported to APPA. Among schools with 20,000 or more students, we found that the University of Minnesota was the most expensive in the nation. Table 4.1 shows the costs for Big 10 Conference schools. Likewise, the University of Minnesota's number of square feet per maintenance employee was among the lowest of the large schools.

APPA's data on average salaries for trades workers indicated that, among Big 10 schools, the universities of Minnesota and Illinois paid the highest annual salaries to trades workers. It is important to note that some staffing reductions occurred at Minnesota after APPA issued its report, but data presented later in this chapter show that Minnesota still employs more shop workers than any other Big 10 school.

TABLE 4.1

1984-5 BUILDING MAINTENANCE COSTS PER SQUARE FOOT
FOR BIG 10 UNIVERSITIES[a]

	Cost Per Square Foot
University of Minnesota	$1.111
University of Michigan	.834
Ohio State University	.818
University of Illinois	.777
University of Iowa	.693
Indiana University	.587
Purdue University	.520
Michigan State University	.507

Source: Office of the Legislative Auditor analysis of data from Association of Physical Plant Administrators of Universities and Colleges, *Comparative Costs and Staffing Report*, (Alexandria, VA: 1986).

[a]University of Wisconsin and Northwestern University did not report cost or staffing data.

B. WORK PLANNING, SCHEDULING, AND FOLLOW UP

A key to maintenance productivity is effective planning and scheduling. According to APPA's manual for physical plant administrators, "probably no other function characterizes the modern approach to maintenance better, or has had a greater impact on the improved efficiency and effectiveness of maintenance activity, than that of work planning and scheduling ...."[5]

Physical Plant management has acknowledged work planning and scheduling problems in the past. In 1981, Physical Plant hired a consultant to evaluate the work scheduling process. The consultant's report resulted in minor improvements in management information.[6] In 1986, Physical Plant's associate director proposed a "work control center" for improved planning and accountability. Physical Plant management then proposed hiring nine planner-schedulers for shops work, but the Board of Regents denied the request in 1987. As discussed in the following sections, our overall assessment of the current system is that:

- Physical Plant has an informal, decentralized system of planning and controlling shops work. Expectations are inadequately communicated to workers, accountability is lacking, and there is little opportunity for effective management of the system.

By industry standards, the University of Minnesota has fewer people trained in planning and scheduling than necessary. Most of the plant maintenance literature we reviewed recommended having a planner/scheduler to serve every 20 to 60 workers. These planners could be part of a separate work control unit, or they could be trained foremen or shop managers. For its 400 shop workers, the University of Minnesota has only one employee formally trained in planning and scheduling, and this person serves more as an analyst of work completed than a planner of future work.

The following sections evaluate specific parts of Physical Plant's system of planning, scheduling, and follow up.

1. Work Assignment and Scoping

Physical Plant's unique work environment makes proper job scoping, assigning, and scheduling a prerequisite for high productivity. Most notably, Physical Plant works on a sprawling campus with limited parking, so it is no easy task getting people and materials to the right place at the right time. In addition, Physical Plant has a more specialized division of labor than many maintenance organizations, resulting in a need for more coordination prior to assigning work. Finally, the use of university buildings for instruction, research, and medical care requires careful planning to minimize disruptions.

We examined the way in which Physical Plant's shops assign jobs and communicate expectations to employees. We concluded that:

- Physical Plant employees often receive unclear assignments.

First, many of the shop tickets we examined gave little indication of the specific work to be done. For example, the "work instructions" on one shop ticket were: "For three months of repair and maintenance to steam distribution system." In other cases, shop tickets described the problem ("room is hot") rather than the task required. Second, as discussed in the next section, most shop tickets do not include time estimates or material requests. Third, our consultants observed that when foremen gave assignments to workers, supervisory instructions were not much different from what was already on the shop ticket.

Thus, workers received little indication of time or quality expectations, safety requirements, equipment or tool needs, material or parts requirements, or methods that may be appropriate. In one case we examined, it took four hours for a shop worker to locate a water shutoff that his foreman later located in five minutes. In another case, a one-hour job became a two-hour job when a worker installing a door did not bring a drill with him to the job site. Better instructions by the foremen might prevent problems such as these.

Our employee survey did not reveal major problems with workers having to wait to get assignments, although Physical Plant could probably reduce waiting time with better scheduling. Workers reported waiting an average of 47 minutes per week to get assignments. This was less time than the workers said they spent waiting for transportation, being transported, or waiting for proper tools and equipment. As shown in Table 4.2, 77 percent of workers said they rarely or never had to wait too long for assignments.

TABLE 4.2

PERCENT OF EMPLOYEES REPORTING WORK SCHEDULING AND ASSIGNMENT PROBLEMS

SURVEY QUESTION: HOW OFTEN DO EACH OF THE FOLLOWING OCCUR?

	Rarely or Never	Sometimes	Often	Usually or Always	Doesn't Apply or Not Sure
Shop tickets are not clear	29.4	50.1	12.3	4.3	3.3
Have to wait too long to get assignments	76.8	15.6	1.9	1.4	4.3
Job requests are sent to the wrong shop	55.5	28.4	4.7	0.4	10.9
Have to wait too long for rides	8.5	27.0	29.4	21.8	13.3
Have to wait too long for tools, materials, or equipment	35.1	37.4	14.7	7.6	5.2

Source: Office of the Legislative Auditor survey of 211 shops employees, May 1988.

Most of Physical Plant's shops do not keep formal work force plans and schedules, and the foremen have not been trained in scheduling. Some shops only keep lists of locations where workers are assigned for their first jobs of the day. Other shops keep lists of jobs being worked on that day, with no information on worker assignments or time estimates. Of 12 shops we contacted, only two said they maintain weekly schedules. Only one shop has a priority system for rating shop tickets. In some shops, workers receive several tickets at a time and can set their own priorities.

Some maintenance scheduling problems can be attributed to inadequate "scoping" of work requests. Scoping a work request involves supervisory or worker visits to the work site to identify tasks and estimate time and material requirements. To make proper assignments, as many as 50 percent of jobs should be scoped, according to our consultants. Emergency jobs and small, routine jobs do not require scoping. We found that:

- Most Physical Plant jobs are not "scoped" by foremen or workers before assignments are made.

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In our consultants' review of a sample of Physical Plant shop projects, they found that nearly 80 percent of the jobs requiring scoping did not receive it. Also, our discussions with Physical Plant foremen confirmed that most spend considerable time working in the office (responding to customer calls, ordering materials, trouble-shooting), rather than in the field. As a result, problems such as the following occur:

-- A one-hour job replacing a ballast took two-and-a-half hours when an electrician had trouble locating a ladder and when he then had to return to the shop to get the proper ballasts.

-- It took shop workers longer than necessary to install telephone conduit in a building because they had to search for materials, and because the conduit's path through ceilings and walls had been poorly defined.

2. Estimating the Time and Cost of Work

The estimation of time and costs serves several purposes, including: (1) helping customers decide whether they want work done, (2) allowing for better scheduling of the work force, and (3) providing a standard against which actual performance can be compared. We found that Physical Plant's shops have not recognized the value of estimates as a tool for scheduling and reviewing performance. As a result, especially in the Minneapolis shops, estimates are usually done only at the request of a customer or on projects that may require management authorization.

The literature we reviewed indicated that most if not all maintenance jobs should be estimated, with emergency work being the main exception. Making proper time estimates may involve a trip to the work site or the use of time standards for routine work. We examined all Physical Plant shop tickets closed in May 1988 and found that:

- Only 10 percent of closed shop tickets for the Minneapolis campus have time estimates, and 56 percent of the St. Paul campus' tickets have estimates.

Of the tickets closed with more than $500 in charges, Minneapolis shops estimated 25 percent of the jobs, and St. Paul shops estimated 71 percent. Even some very large projects are not estimated. In the samples of jobs we reviewed, we found a $120,000 rewiring job and a $59,000 steam system repair job without estimates.

We also examined the accuracy of Physical Plant time estimates and found that:

- For those jobs where estimates exist, Physical Plant usually underestimates anticipated labor hours.

It is not clear whether this indicates unrealistic estimation of job times, low employee productivity, or changes in the scope of the work following estimation. In May 1988, the St. Paul shops' estimated hours were 71 percent of the actual hours of these completed jobs. Minneapolis' estimated hours were 91 percent of the actual hours. However, a closer analysis shows that even Minneapolis' estimates are quite inaccurate. For example, in the Minneapolis paint shop, where total estimated hours in May were nearly 100 percent of actual hours, the shop seriously misestimated many jobs. Of the tickets that were overestimated, the shop misestimated two-thirds by more than 50 percent. Of the tickets that were underestimated, the shop misestimated two-thirds by at least 25 percent.

There are industry time standards for many maintenance jobs, and supervisors could use these to estimate routine or frequent work. Physical Plant's associate director distributed a list of these standards in early 1988, but our interviews indicated that they have not been used much.

3. Work Documentation and Accountability

To evaluate the productivity and cost-effectiveness of Physical Plant work requires some indication of work completed. However, we found that:

- Documentation of work performed by Physical Plant shops is consistently poor. The shops rarely report differences between the work originally authorized on the shop ticket and the work actually completed.

In a review of 40 projects, we found only three that documented the work actually performed. Examples of poor documentation and accountability include the following:

-- In 1984, a shop ticket authorized repair of four double-frame doors, with a $9,000 cost estimate. The shops repaired only two doors but continued to charge labor hours for other work to this ticket until depleting the authorized amount in 1988.

-- The shops completely rewired a dormitory, and the last craftsman worked on the job on December 1, 1987. However, the job manager charged his hours to this project for the next two-and-a-half months.

-- A shop ticket for the carpentry shop authorized construction of a bench. However, our interviews revealed that the job completed differed significantly from the job described on the ticket, but this ticket included no documentation of the work actually done. Rather than building a bench, the shop fabricated and installed a formica countertop.

-- An October 1987 authorization called for "three months of repair and maintenance to steam distribution system," and the ticket's original "due date" was November 26, 1987. Two people worked full-time on this shop ticket from mid-October 1987 until late April 1988. The ticket's "due date" was not changed until late March 1988. The ticket gives no indication of what work was expected, nor does it provide any documentation of what was accomplished.

-- Of the 40 projects we reviewed, there were no instances of returning unused portions of materials for credit (including one job involving more than $30,000 in materials). Thus, workers apparently store some leftover materials in the shop that have already been charged to completed tickets.

-- We also found that the shops obtain some items (such as faucet washers) in quantities far larger than needed for the current project and charge the entire quantity to whatever ticket is being worked on. Consequently, there may be very large material charges for relatively small jobs.

Our consultants estimated how long the jobs described on shop tickets should take and compared this to the actual time charged to the ticket. The consultants used industry standards to estimate appropriate job times and usually asked workers whether the

estimates seemed reasonable. In 24 of the 40 cases reviewed, the time charged by Physical Plant exceeded what our consultants estimated to be an appropriate time. Shop workers often explained the discrepancy by claiming that they did additional work at the site that was not noted on the original ticket. For example, on a ticket calling for replacement of one relay, the worker actually replaced three, but did not record this change in scope on the ticket. Workers often told us that it did not matter if they charged additional work to a ticket, because the funds all came out of the same budget.

The absence of work documentation seriously hinders effective shop management. Lacking better documentation, supervisors cannot assess productivity or determine the costs associated with work completed unless they discuss each completed job with workers (as we did). Furthermore, the practice of charging unrelated labor hours to shop tickets removes accountability from the shop ticket system. It may encourage shops to charge hours to a shop ticket until the authorized amount has been spent.

4. Follow Up and Employee Evaluation

Better plans and schedules will yield only limited benefits if there are no means for reviewing whether they are met and communicating with workers about their job performance.

As noted earlier, foremen usually spend more time in the office than in the field. Although Physical Plant management thought that adding area managers in mid-1987 would free up some of the foremen's time to do field visits, the foremen we talked to said this has not occurred. In addition, of the projects reviewed by our consultant, only six appeared to have received adequate follow up by a supervisor.

We also found that:

- Physical Plant has no formal means of evaluating the performance of trade workers.

As a result, Physical Plant does not provide enough feedback to workers or have routine means of documenting unsatisfactory performance. Although most trade workers come to Physical Plant with extensive technical training and experience, foremen readily admit that performance and productivity vary from person to person. Foremen in all of the shops do inspections of selected jobs, although they often omit follow up when their time is consumed by customer phone calls. Inspections rarely result in written evaluations of employee performance, and none of the shops have annual employee evaluations. This is in contrast to Physical Plant's Custodial Division, where employees receive formal ratings every two months. According to our employee survey, 26 percent of shop workers reported that they are "rarely or never" informed by supervisors about the quality of their work, and another 29 percent are "sometimes" informed. About 30 percent of the shop workers expressed dissatisfaction with the amount of praise they get for doing a good job. Some employees expressed an interest in having periodic group meetings with their supervisors. For example, the construction shop has monthly employee meetings that give supervisors an opportunity to express concerns and compliments to workers.

C. STAFFING AND WORK RULES

1. Setting Staff Levels

Physical Plant trade shops operate on a "day-worker" basis. Physical Plant hires skilled trade workers to work from day to day and can lay them off any day there is not enough work. Physical Plant management and union representatives say this arrangement allows needed flexibility in staffing to quickly respond to workload changes. This system assumes that management: (1) analyzes and predicts the workload, and (2) expands or reduces the work force accordingly.

We found that:

- Physical Plant management lacks useful information on which to base staffing decisions. Management has no means of comparing hours of staff time available to estimates of the demand for services.

Analysis of work backlog may be one of the best ways to determine appropriate staffing levels. "Backlog" is work requested but not yet assigned due to lack of time, funds, or staff. However, we found that Physical Plant managers do not routinely monitor work backlog, and the lack of reliable time estimates (discussed in the previous section) prevents effective backlog reporting. We made very rough estimates of shops' work backlog by comparing the number of call-in tickets closed weekly to the number of "waiting" tickets at two points in time. As shown in Table 4.3, shops average about a two-week work backlog. If accurate, this is a relatively slim backlog, although it is within the acceptable range recommended by many maintenance management experts. However, some shops appear to have only several days of backlog, while others have more than a month. Physical Plant has no guidelines on acceptable levels of work backlog.

Physical Plant staff told us that they assess staffing levels by comparing staffing to workload for each shop. The most recent analysis plotted the actual hours of paid work over the last three years against the available hours of workers' time. Figure 4.1 is an example of the shop-specific graphs produced by Physical Plant, this one for the electric shop. The lower line, manpower utilized, is simply the hours of paid work as shown by payroll records for each time period. The upper line is the manpower available, or 40 hours per week multiplied by the number of workers on the payroll. While Physical Plant has used such graphs to evaluate staffing levels, we found the analyses to be of little practical value. The difference between the lines is simply hours of vacation, sick leave, or leave without pay, not a measure of unproductive time. Thus, the analysis provides no information about the number of hours or workers required to complete a given amount of work and does not help in setting staff levels.

Physical Plant produces monthly workload forecasts for each shop. These projections rely on available time estimates for future work and historical information regarding number of shop tickets and average time per ticket. However, there are relatively few work estimates, and the use of historical information assumes that past work was productive. Thus, we question the usefulness of these forecasts for setting staff levels.

Because there are no data that permit an accurate estimate of workload or demand for services, Physical Plant lacks the necessary tools for making staffing decisions. Also, it cannot systematically evaluate the efficiency of workers or assess whether workers "stretch" jobs to fill available time.

TABLE 4.3

ESTIMATED SHOPS BACKLOGS, MAY 1988
(In Weeks)[a]

Shops	Minneapolis	St. Paul
Carpentry	2.2	3.1
Construction	1.7	1.4
Electric	2.6	2.1
Elevator	1.3	1.4
Key	1.9	2.0
Miscellaneous Repair	1.3	1.8
Health Sciences Miscellaneous Repair[b]	4.1	--
Paint	2.9	2.1
Pipe Covering	4.4	2.3
Plumbing	1.7	1.2
Refrigeration	4.9	0.6
Sheet Metal	1.8	4.5
Steam	1.8	6.0
Ventilation	2.7	1.0
AVERAGE	2.3	2.1

Source: Office of the Legislative Auditor analysis of May 1988 Physical Plant shop tickets.

[a]To determine backlog, we estimated the average number of tickets closed per week during May 1988. We compared this to the average number of "open" tickets on which work had not yet been done as of two dates in May.

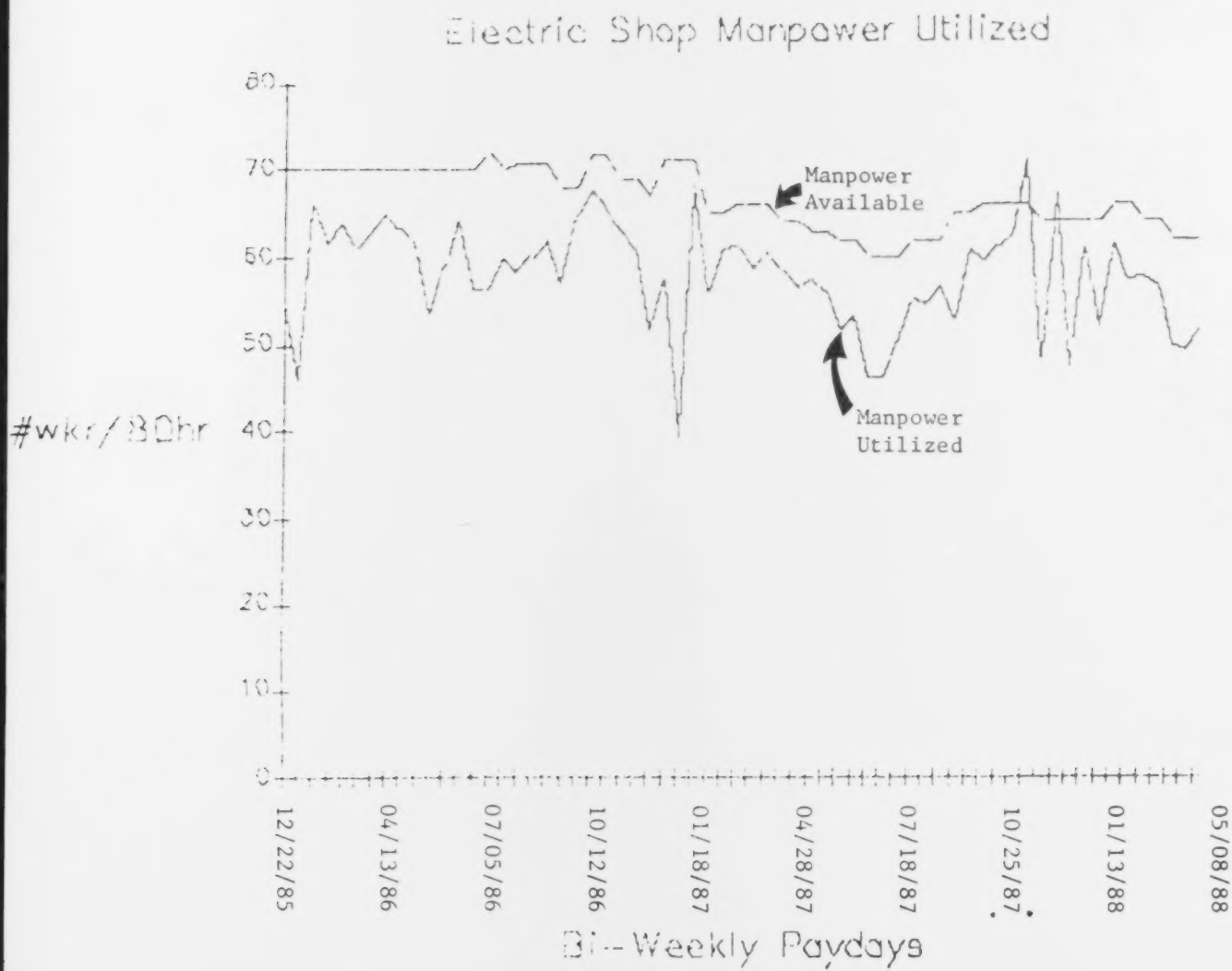
[b]Health Sciences trades shops are included in Minneapolis counts.

In addition to assuming that Physical Plant has data for analyzing workload, the "day-worker" concept also assumes that Physical Plant expands or reduces its workload in response to workload variations. From our discussions with shop supervisors, we found that:

- Most Physical Plant trade workers are full-time, year-round employees. Physical Plant shops avoid the use of short-term employees or layoffs.

FIGURE 4.1

EXAMPLE OF STAFFING ANALYSIS DONE BY PHYSICAL PLANT SHOPS



Source: University of Minnesota Physical Plant Shops Work Support Unit, May 1988.

Physical Plant has initiated major layoffs twice in the last several years, both times because of budget problems. In 1982, Physical Plant laid off 43 Teamsters and trade workers in the shops. In early 1987, Physical Plant laid off about 70 trade workers in the shops. Some shops, such as paint and roofing, undergo seasonal layoffs every year. Decisions concerning layoffs in the trade shops are left to the general foremen in most cases, and are a joint decision between foremen and area managers in others. Attrition, or simply not filling vacancies as they occur, is the simplest way to reduce staff levels. Layoffs among civil service employees and Teamsters are complicated by a seniority system and the "bumping" process, by which one employee takes the job of another with less seniority to avoid layoff.

Foremen told us they do not like to lay off trade workers or hire short-term employees because: (1) they sometimes lose control over which workers they can recall when workload increases, (2) new employees require more supervision due to their lack of familiarity with the campus and Physical Plant procedures, and (3) Physical Plant likes having a reputation in the union halls as a steady employer.[7] Furthermore, as we noted earlier, the workload is not always predictable. The shops' aversion to layoffs and temporary employees may be due to the uncertainty about how long a work slowdown or increase will last.

When there is a work slowdown, many shops convert to four-day work weeks to avoid layoffs. Four weeks of four-day work weeks occurred in the sheet metal shop in March and April 1987. Sometimes, when there is high metropolitan unemployment in a particular craft, the trade union will ask all union members to take vacation in a certain time period. In December 1987, Local 292 of the International Brotherhood of Electrical Workers issued such a directive due to high unemployment among Twin Cities electricians. The union asked members to take one or two weeks of vacation before April 1, 1988. Due to low workload, Physical Plant hired no replacements during this time.

When the shops perceive a temporary work increase, some go to overtime in the form of 10-hour work days. This occurred in the refrigeration shop for at least eight weeks beginning in late April 1988. The area manager said that he cannot justify a new employee without at least six months of work to assure probable permanent employment. Thus, this shop paid additional wages for routine work rather than adding short-term employees at standard wages.

2. Work Rules

"Work rules" are an inevitability of collective bargaining agreements. They define jobs and establish the terms and conditions under which they are performed. Work rules may also affect productivity and impede flexibility in the use of labor. We found that:

- Jurisdiction and seniority issues have a significant effect on how the work gets done at Physical Plant.

Jurisdictional issues can be an obstacle to efficiency and productivity. All trade contracts contain restrictions on what tasks each craft can perform to avoid encroaching on another's territory. Trade workers widely respect these labor classifications, and quickly resolve disputes among themselves regarding task distinctions. Jurisdiction lines sometimes contribute to inefficiency by requiring more than one craftsperson to work on the same job. For example, an *electrician* must disconnect and reconnect an

electric motor so that a *mechanic* can repair it, and a *carpenter* must slide a ceiling panel aside so that a *ventilation mechanic* or *electrician* can reach a piece of equipment above. We found it difficult to assess the extent of these inefficiencies. Separate shop tickets are usually written for each shop involved, so there is no easy way to tell how many different trades worked on a particular job and who did what.

Jurisdiction is also an issue within shops represented by the Teamsters Union. The Teamsters Union contract contains distinct job classifications and responsibilities with accompanying wage scales. Grievances often occur when workers are assigned to jobs outside their classification. They are filed by workers who should have had the work or by those who did not receive premium pay for working outside their class.

As noted, jurisdictional issues between trade workers or among Teamsters can usually be resolved quickly. However, we found that:

- The most important jurisdictional issues occur between trade workers and Teamsters.

Tradition, territorial concerns, and job security motivate unions to maintain or enlarge their share of the work. Trade contracts often limit which tasks non-trade maintenance workers can perform. For example, trade plumbers must replace toilet seats, according to their contract, yet maintenance mechanics are capable of this in most cases. Also, city and state laws require trade licensing for some jobs. Conversely, Teamster job classifications often prohibit non-Teamsters from driving vehicles, as will be discussed later in this chapter. The jurisdictional lines that distinguish the tasks of maintenance mechanics and trade workers are often unclear. Examples of tasks that present confusing jurisdictional issues include cutting thin sheet metal and putting new panels in overhead doors.

The shops sometimes resolve these issues informally, based on which shop has a smaller backlog, or based on traditional labor divisions. Historically, there has been a swing in the workload from the trades to the mechanics and back over time. The division of work in the Health Sciences shops illustrates this. Mechanics used to do certain routine maintenance jobs like unplugging toilets and repairing door hardware. In recent years, the assistant director or principal plant engineer assigned these jobs to trade plumbers and carpenters until a recent Teamster grievance resulted in their return to the mechanics.

Another "work rule" that can influence efficiency and productivity is the seniority system, which affects civil service and Teamster employees but generally does not affect trade or student workers. It affects productivity and efficiency through the firing, hiring, and promotion process. Because of complicated "bumping" procedures, the process is slowed and many staffing decisions may be effectively taken out of the hands of management. When senior employees "bump" less senior employees, managers sometimes complain that the most senior candidate is not the most qualified for a specific job. Similarly, less senior, but more qualified, employees may be lost during layoffs.

3. Comparisons to Other Physical Plant Operations

To compare staffing and work rules at the University of Minnesota and other physical plant operations, we surveyed physical plant directors at all other Big 10 universities,

the University of Minnesota coordinate campuses, the University of Minnesota Hospital, the state of Minnesota, Mankato and St. Cloud State Universities, Minneapolis Public Schools, Ramsey County, Honeywell, and 3M. We chose these employers because of their similarity to Physical Plant in function, size or location. Figures 4.2 and 4.3 summarize the survey responses relating to staffing and labor relations issues. We found that:

- Physical Plant is one of the few employers whose trade workers are represented by multiple (19) locals and are paid prevailing wage rates.

Most other Big 10 universities and Minnesota employers hire unionized labor. But only Wisconsin and Illinois hire employees from multiple trade unions and pay prevailing wage for maintenance and limited in-house construction work. Of the Minnesota employers surveyed, only 3M pays prevailing wage and only to its in-house construction unit workers, who are represented by multiple trade unions (3M pays less than prevailing wage for maintenance work). Physical Plant pays prevailing wage for maintenance because it hires directly from union halls and honors the union scale wages set in individual trade contracts. This arrangement has continued for more than 50 years, with the support of the Board of Regents. Most respondents we surveyed hire outside contractors for construction and large remodeling jobs. Most pay prevailing wage for construction work, either in-house (as at 3M) or using outside contractors. However, it is unusual to hire contracted trade workers for maintenance work at the prevailing wage. In part, this reflects the fact that maintenance work is usually more steady than construction work.

Some Regents that we talked with believe that state law requires the University to pay prevailing wages to trade workers. We reviewed the statutes and received interpretations from labor law experts at the state and the University. According to the people we talked with, state laws do not compel the University to pay prevailing wages to its maintenance trade workers.

Our survey of other institutions also revealed that Physical Plant is one of the few organizations that has trade union shop foremen in supervisory positions. Shop foremen in such situations may feel a conflict between union and management interests. Most other universities and local employers employ civil service supervisors or other salaried supervisors, who may belong to a management union but are not members of the same union as those they supervise.

Table 4.4 presents information on the number of in-house maintenance and construction workers compared to square footage of building space for each Big 10 campus. Minnesota ranks seventh with 32,900 square feet per worker. Some of the variance in square footage of building space per worker is because the amount of in-house construction and remodeling work varies greatly among the campuses. Minnesota now does no remodeling projects and Illinois and Michigan do projects up to $500,000. Typically, we would expect those schools that do little remodeling in-house to have smaller staffs and more square feet per worker. Yet Minnesota, which does the least in-house construction, has one of the largest staffs.

FIGURE 4.2

SHOPS STAFFING AND WORK RULES:
THE UNIVERSITY OF MINNESOTA
COMPARED TO OTHER BIG 10 UNIVERSITIES

Issue	Comparison
Union Representation	Physical Plant employs skilled trade workers, represented by 19 different locals, for maintenance and repair work. Only Wisconsin and Illinois have similar arrangements. Most have one contract for all trade workers. However, Indiana has little union representation for shops employees, and Purdue has none.
Prevailing Wage	Physical Plant pays prevailing wage to trade workers for maintenance and repair work. Only Wisconsin and Illinois operate similarly. All others pay less than prevailing wage.
Union Supervision	Physical Plant employs union foremen to supervise shops. Most shop supervisors elsewhere are non-union or belong to management unions.
Work Rules	Physical Plant's main issues are jurisdiction and seniority. Others cited issues of seniority, use of outside contractors, inflexibility of work hours, overtime, and grievances.
Contracting	All Big 10 universities contract for major remodelling and new construction work. In-house work is limited to jobs under $2,500 at Minnesota, $25,000 at Iowa, $30,000 at Wisconsin, $50,000 at Purdue, Northwestern, Ohio State, and Indiana, $50-100,000 at Michigan State, and $500,000 at Michigan and Illinois.

Source: Office of the Legislative Auditor June 1988 survey of the following Big 10 Universities: Purdue, Northwestern, Ohio State, Michigan State, Wisconsin, Illinois, Michigan, Iowa, and Indiana.

FIGURE 4.3

SHOPS STAFFING AND WORK RULES:
THE UNIVERSITY OF MINNESOTA
COMPARED TO OTHER EMPLOYERS IN MINNESOTA

Union Representation	Physical Plant employs skilled trade workers, represented by 19 different locals, for maintenance and repair work. All other surveyed employers hire trade workers under one contract for maintenance and repair work. 3M's construction unit is staffed with trade workers represented by individual unions.
Prevailing Wage	Physical Plant pays prevailing wage to trade workers for maintenance and repair work. All other surveyed employers pay less than prevailing wage for maintenance and repair work. 3M pays prevailing wage to its construction unit.
Union Supervisions	Physical Plant employs union foremen to supervise shops. The State, state universities, and Ramsey County have some lead union workers in shops, as well as civil service supervisors. 3M has salaried supervisors. Honeywell has union maintenance supervisors. All others have civil service supervisors.
Work Rules	Physical Plant's main issues are jurisdiction and seniority. Most other employers mentioned jurisdiction and seniority as well. The coordinate campuses have trouble interpreting Teamster contracts that have been negotiated with a focus on the Twin Cities campus.
Contracting	All employers but 3M contract for major remodeling and new construction. Minneapolis public schools do most remodeling in-house. Expressed limits on in-house work include: $2,500 at Physical Plant, $10,000 at the coordinate campuses, $50,000 at the State Universities, and $15,000 at Ramsey County.

Source: Office of the Legislative Auditor June 1988 survey of the following: University of Minnesota campuses at Morris, Waseca, Crookston and Duluth; the University of Minnesota Hospital; the State of Minnesota; Mankato and St. Cloud State Universities; Minneapolis Public Schools; Ramsey County; 3M; Honeywell.

TABLE 4.4

SHOP STAFFING AT BIG 10 UNIVERSITIES

Big 10 University	Dollar Limit On In-House Remodeling[a]	Number of Shops Workers[b]	Square Feet of Building Space (in millions)	Square Feet Per Worker (in thousands)
Northwestern	$ 50,000	98	6.2	63.7
Wisconsin	30,000	244	14.0[c]	57.4
Michigan State	50-100,000	173	9.4	54.2
Iowa	25,000	152	5.6	37.1
Ohio State	50,000	270	9.9	36.5
Indiana	50,000	185	6.3	34.2
MINNESOTA	**2,500**	**389**	**12.8**	**32.9**
Michigan	500,000	309	9.5	30.6
Illinois	500,000	389	9.3	23.8
Purdue	50,000	307	7.1	23.2

Source: Association of Physical Plant Administrators for Universities and Colleges (square footage for all universities except Northwestern and Wisconsin), and Office of the Legislative Auditor, July 1988 phone survey.

[a]Jobs above this amount are contracted. Respondents indicated these are typical limits, and they often contract much smaller jobs. Generally, organizations that contract out more remodeling and construction work require fewer shop employees per square foot.

[b]Full-time-equivalent craftsmen, mechanics and students. Supervisors not included.

[c]Rough estimate.

4. Alternative Staffing Arrangements

As noted, Physical Plant shops employ a variety of trade specialists represented by multiple unions and paid prevailing wages. To determine whether this results in higher costs for maintenance and repair work, we compared Physical Plant's costs for routine maintenance jobs to those at the University's coordinate campuses, the University Hospital, and the state of Minnesota. Figure 4.4 shows how each employer reportedly assigns a sample of six maintenance jobs and the associated labor costs. We found that:

- Physical Plant pays higher hourly wages for routine maintenance jobs than other area institutions.

- Other area institutions employ a greater proportion of "general" maintenance staff than Physical Plant, or else hire specialists under one contract at a common wage that is lower than prevailing wage.

FIGURE 4.4

COMPARATIVE STAFFING ARRANGEMENTS
FOR SIX TYPICAL MAINTENANCE JOBS[a]

Job	Minneapolis, St. Paul, Health Sciences Shops (Trades and Teamsters)[b]	Coordinate Campuses (Teamsters)[b]	U. of M. Hospital (Teamsters)[b]	State of Minnesota (AFSCME)[b]
1. UNPLUG TOILETS	Trade Plumber $23.69/hr	Plumber $16.37/hr or Mechanic $12-15.00/hr	Maint. & Op. Mechanic $15.67/hr	Plumber $16.05/hr[c]
2. CHANGE LIGHT BULBS	Building and Grounds Worker $10.08-12.40/hr or Mechanic $14.86/hr or Trade Electrician $25.15/hr[d]	Building and Grounds Worker $10.08-12.40/hr	General Mechanic $12.38/hr	Plant Maint. Engineer $16.05/hr or Helper $13.13/hr
3. REPAIR DOORS, WINDOWS	Trade Carpenter $21.48/hr	Carpenter $16.37/hr or General Mechanic $12.83/hr	Maint. & Op. Mechanic $15.67/hr	Carpenter or Construction Laborer $16.05/hr
4. MAINTENANCE ON DRINKING WATER COOLERS	Trade Plumbers $23.69/hr or Trade Ref. Mechanic $24.62/hr Health Sciences-Mechanic $15.67/hr)	Refrigeration Mechanic or Plumber $16.37/hr	Maint. & Op. Mechanic $15.67/hr	Plant Maint. Engineer or Ref. Mechanic $16.05/hr
5. PREVENTIVE MAINTENANCE ON ELECTRIC PANEL BOARDS	Trade Electrician $25.15/hr	Electrician $16.37/hr (Duluth-Trade Electrician $23.18/hr)	Trade Electrician $25.15/hr or Maint. & Op. Mechanic $15.67/hr	Electrician $16.05/hr
6. PREVENTIVE MAINTENANCE ON SUPPLY AIR FANS	Maint. & Op. Mechanic $14.86/hr or Trade Sheet Metal Worker $24.02/hr	Maint. & Op. Mechanic $14.86/hr	Maint. & Op. Mechanic $15.67/hr	Plant Maint. Engineer or Machinist $16.05/hr

Source: Office of the Legislative Auditor June 1988 phone survey.

[a] All Teamster and AFSCME rates are the maximum as of 7/1/88. Trade rates are for journeymen as of 5/1/88.
[b] AFSCME and Teamster salaries shown include an additional 20 percent to cover benefits, which are already included in the trade rates.
[c] AFSCME rates are the maximum for a regular worker, not a lead worker.
[d] Ordinary lights = Building and Grounds Worker. Special lights = mechanic. High voltage or high ceiling lights = trade electrician.

An increasing number of organizations are using "generalists" to do certain maintenance tasks. A recent manual on maintenance management observed that "[p]erhaps the greatest innovation that has taken place in maintenance in the past twenty-five years is the acceptance of the multicraft maintenance mechanic as a labor category."[8] The University's coordinate campuses and hospital employ general maintenance and operations mechanics to do most maintenance work.[9] They are represented by the Teamsters Union and are covered under the same contract as those at Physical Plant. These mechanics include some craft specialists who hold the same licenses as union trade workers, but all mechanics on a campus or at the hospital receive the same wage. Even the maximum mechanic wages are considerably less than those of most Physical Plant trade workers. The coordinate campuses do not employ specialized workers under trade contracts. They are not held to the master contract or individual trade union agreements negotiated by the Twin Cities campus since there are no trade union locals in their area.[10] Some coordinate campuses bring in trade workers from the Twin Cities campus to provide special expertise. The hospital must pay Physical Plant trade workers to do all painting and electrical work because of contract restrictions.

The state of Minnesota employs specialized trade workers under one contract for maintenance work. By statute, they are all in one bargaining unit and are represented by the American Federation of State, County and Municipal Employees (AFSCME).[11] They specialize by craft, with the same licensing and training as local trade workers, but all receive the same wage. This wage, at the maximum level and including benefits, is anywhere from 25 to 35 percent below the wages of Physical Plant trade workers.

At Physical Plant, both Miscellaneous Repair shops (represented by the Teamsters) and many specialized trade shops perform routine maintenance tasks. These shops have done little or no remodeling in 1988. The maximum wages and benefits of Miscellaneous Repair shop mechanics are from 20 to 45 percent less than the prevailing wages of most trade workers.

For each job listed in Figure 4.4, Physical Plant shops paid the most for labor. Unless Physical Plant's work quality is appreciably better than the other institutions', its specialized trade agreement may be a less cost-effective way to accomplish routine maintenance than the common trade agreements, general maintenance staff, or permanent maintenance employees used by other large employers. Figure 4.5 lists the pros and cons of the current Physical Plant specialized trades arrangement and the alternatives of making trade workers University employees, employing more general maintenance workers, and employing trade workers under one contract. The primary advantage of the current arrangement is the theoretical flexibility in staffing it provides. However, as we noted, Physical Plant does not always utilize this flexibility. Physical Plant's problems with workload estimation and planning contribute to its tendency to maintain a static workforce. The primary disadvantage to the current arrangement is the high labor cost for workers that may be more specialized than necessary, and whose wages are higher than those of shop workers in comparable organizations.

FIGURE 4.5

PROS AND CONS OF CURRENT AND ALTERNATE PHYSICAL PLANT OPERATIONS STAFFING ARRANGEMENTS

CURRENT SPECIALIZED TRADES ARRANGEMENT

Pros

- Workers all receive skills training, go through apprenticeships, and are licensed.
- No lengthy recruiting process is necessary when hiring through union halls.
- Applicant screening by union halls eliminates some unqualified workers.
- Staffing levels are flexible, in theory. Management can hire, fire on short notice in response to workload changes. The shops can send unsatisfactory workers back to the union halls.

Cons

- Strict jurisdictional lines sometimes results in confusion and inefficiency when several workers are necessary for one job.
- Overspecialization, or the use of highly skilled workers to do routine jobs.
- Higher wages for maintenance and repair work than paid at other local institutions, since the University accepts the prevailing wage levels of each respective trade.
- Tension between union shop foremen and civil service supervisors. Also, a potential conflict of interest for shop foremen between union and management.

ALTERNATE STAFFING ARRANGEMENTS

- *Making Physical Plant trade workers permanent University employees* could formalize the year-round, full-time employment arrangement that Physical Plant has with most trade workers. If benefits were paid through the University, workers might receive some additional benefits, such as sick leave. The University would have a freer hand to negotiate wages less than prevailing wages, in exchange for job security and benefits. However, the hiring and firing processes for permanent employees tend to be tedious, perhaps making this a more inflexible staffing system. It is more difficult to fire unsatisfactory workers in civil service systems, and the work rules related to seniority could complicate the hiring process.

- *Employing more general maintenance workers* would encourage Physical Plant to use specialized trade workers more efficiently. Skilled trade workers could then be used only where their advanced skills and training were required. The wage rates of "generalists" now employed by Physical Plant are lower than those of specialists, so the costs of routine work could be reduced by using more generalists. The use of generalists could increase flexibility in staffing assignments, allowing one worker to do jobs previously done by more than one. However, the use of more generalists might result in new jurisdictional disputes regarding jobs previously done by trade specialists.

FIGURE 4.5
(Con't)

ALTERNATE STAFFING ARRANGEMENTS

- *Employing trade workers under a single, more extensive contract* might allow Physical Plant to simplify union-management relationships, since there would be fewer contracts to abide by. Jurisdictional restrictions might be reduced if Physical Plant was not held to individual trade contracts. This arrangement might also make it easier for Physical Plant to negotiate a common wage for trade workers, which many other organizations have.

D. PREVENTIVE MAINTENANCE ON EQUIPMENT

The primary purpose of preventive maintenance is to prolong equipment life. It usually involves equipment inspection, cleaning, lubrication, adjustment, or minor parts changes. According to our review, Physical Plant's shops spend about one out of every five hours doing preventive maintenance on equipment. This varies considerably among the shops, as shown in Table 4.5. For example, the refrigeration and ventilation shops spend three-fourths of their time doing preventive maintenance work, while some large shops (construction, paint, pipe covering, sheetmetal, carpentry, plumbing) devote little or no time to preventive maintenance.

It is important to distinguish between "deferred maintenance" (referenced in Chapter 2) and "preventive maintenance." Most projects on the University of Minnesota's deferred maintenance list are building repairs, while most activities in its preventive maintenance schedule are for equipment maintenance.

We hired a consultant to make a technical assessment of Physical Plant's preventive maintenance activities. The consultant reviewed (1) a representative sample (346 activities) of eight shops' preventive maintenance schedules, (2) a representative sample (144 activities) of activities scheduled but not performed in March 1988, and (3) 50 equipment items on site.

TABLE 4.5

PERCENT OF SHOP TIME SPENT DOING PREVENTIVE MAINTENANCE

Shop	Preventive Maintenance Hours	Total Hours	Percent
Carpenter	171.0	4,006.8	4.3
Construction	0.0	2,531.1	0.0
Secondary Electrical	1,078.8	7,156.1	15.1
Primary Electrical	466.0	1,449.0	32.1
Elevator	310.0	966.0	32.1
Key	0.0	697.2	0.0
Health Science Mechanics	1,893.5	3,888.5	48.7
Miscellaneous Civil Service	66.0	88.0	75.0
Miscellaneous Repair	206.2	3,201.6	6.4
Paint	0.0	4,467.3	0.0
Pipe Covering	0.0	1,738.1	0.0
Plumbing	167.0	2,692.1	6.2
Refrigeration	1,600.6	2,196.4	72.9
Sheetmetal	7.0	1,783.2	0.4
Steam	429.0	3,889.1	11.0
Ventilation	2,059.7	2,713.2	75.9
TOTAL	8,454.8	43,463.0	19.5

Source: Office of the Legislative Auditor review of shop tickets closed in February 1988.

1. Development of the University's Preventive Maintenance System

The foundation of the University of Minnesota's preventive maintenance system is an inventory of thousands of cyclical activities which Physical Plant has entered into a computer database. The entries include the frequencies with which the preventive maintenance activities should occur (such as annually, monthly, or weekly). At the beginning of each month, the computer prints shop tickets for upcoming activities, and these are distributed to the appropriate shops.

A University engineering intern developed Physical Plant's preventive maintenance system nearly 20 years ago. At the time, the main focus was computerization of the system, rather than applying engineering standards to the schedule of preventive maintenance activities. We found that:

- The preventive maintenance system evolved over the past 20 years with little central Physical Plant control or engineering input.

Following computerization of the system, shop foremen could add new activities or change the frequency of activities on the system simply by contacting clerical staff in the shop superintendent's office. Physical Plant management has never developed manuals or policy statements on inclusion of activities in the preventive maintenance system. Consequently, the development of Physical Plant's preventive maintenance program has been incremental, not a planned, comprehensive effort. Thus, the same type of equipment might be maintained very differently in Minneapolis shops than in St. Paul shops, and shops have their own systems for coding activities in the preventive maintenance inventory.

2. Review of Physical Plant Preventive Maintenance Practices

During our interviews with Physical Plant staff, some managers and engineers expressed concern about the lack of central controls over the preventive maintenance system. Specifically, some staff felt that the shops might schedule excessive preventive maintenance as a way of sustaining high staffing levels. Also, they questioned whether shop supervisors had the technical and analytical backgrounds to determine appropriate preventive maintenance frequencies for equipment. In 1986, Physical Plant's own engineers reviewed the preventive maintenance activities scheduled in one building (Elliot Hall) and concluded that several of the activities could be reduced by 30 percent.

To help us determine the adequacy of the University of Minnesota's practices, we obtained the services of a consulting engineering firm with extensive experience in preventive maintenance systems. Our consultant reviewed a representative random sample of Physical Plant's preventive maintenance inventory from eight shops. Overall, we concluded that:

- The University of Minnesota schedules preventive maintenance more frequently than equipment manufacturers or industry standards call for. However, it is unclear whether this is an excessive or appropriate level of scheduled maintenance.

- Physical Plant does significantly less preventive maintenance than it schedules.

Table 4.6 summarizes our consultant's analysis of Physical Plant's preventive maintenance schedule. Based on equipment manufacturers' recommendations and industry standards, the consultant found that 31 percent of the equipment items need more frequent service than currently scheduled, and 49 percent less frequent. The consultant indicated that preventive maintenance generally is not cost-effective for items with replacement or repair costs under $500 unless the equipment is critical to health or safety, such as fire extinguishers. Also, shops need not schedule preventive maintenance for equipment if there is little that can be done to prevent a breakdown. Thus, our consultants did not recommend preventive maintenance on items such as drinking fountains and hot water heaters.

Our consultant also assumed that frequent "operator inspections" should not be on the preventive maintenance system. Because some require so little time or are so unpredictable, the consultant felt they are best done on non-scheduled shop tickets or standing orders. In these cases, the consultant recommended "less frequent" service, meaning removal from the preventive maintenance system rather than eliminating the activity. Physical Plant staff have consciously scheduled a large number of these inspections on the preventive maintenance system because they believe equipment is old and in need of frequent inspection.

TABLE 4.6

CONSULTING ENGINEERS' RECOMMENDATIONS ON UNIVERSITY OF MINNESOTA'S PREVENTIVE MAINTENANCE SERVICE AND FREQUENCY[a]

Shop	Maintenance Frequency Recommended By Consulting Engineers: Same as Currently Scheduled	More Than Currently Scheduled	Less Than Currently Scheduled[b]	Type of Service Recommended By Consulting Engineers: Same as Currently Scheduled	More Than Currently Scheduled	Less Than Currently Scheduled[b]	Equipment Items for Which Consultant Recommended No Scheduling on the Preventive Maintenance System
Secondary Electrical	15	0	8	11	3	9	4
Primary Electrical	13	1	9	10	5	8	5
Elevator	0	3	1	0	3	1	0
Health Sciences Mechanics	9	8	25	6	14	22	9
Miscellaneous Civil Service	0	76	0	76	0	0	0
Refrigeration	2	0	35	1	1	35	24
Steam	11	8	31	12	0	38	25
Ventilation	19	12	60	18	38	35	14
	69 (20%)	108 (31%)	169 (49%)	134 (39%)	64 (18%)	148 (43%)	81 (23%)

Source: Report of Applied Management Engineering to Minnesota Office of the Legislative Auditor (July 1988) based on a sample of 346 preventive maintenance activities.

[a]"Service" is the intensity and scope of maintenance. "Frequency" is how often the maintenance occurs.

[b]Includes items for which consultants recommended "no scheduling on the preventive maintenance system." The consultant felt that many of these activities (such as inspections by equipment operators) could be done more effectively on a repair shop ticket, rather than a preventive maintenance ticket. That is, the consultant recommended continuing the activity, but not scheduling the activity on the preventive maintenance system.

Our consultant also said there are several preventive maintenance activities that Physical Plant should probably schedule more frequently. For example, our consultant reported that Physical Plant schedules too little maintenance on some of the University's fume exhausters, which are critical to building safety, and some air compressors, which are subject to considerable wear-and-tear.[12]

Overall, however, our consultant concluded that the University of Minnesota has an unusually large amount of equipment scheduled for preventive maintenance. Our consultant compared Minnesota's number of equipment items per 1,000 square feet of building space to three other universities (Iowa, Virginia, and North Carolina). Using this gross measure, Minnesota schedules preventive maintenance on about 40 percent more equipment than these institutions.

In response to the consultant's report, Physical Plant staff raised some plausible explanations for scheduling the current levels of preventive maintenance. In general, Physical Plant staff think the University has unique circumstances that justify higher than normal levels of preventive maintenance. For example:

-- Physical Plant staff told us that the quality of steam used to heat and cool the University is extremely poor. As a result, steam valves often get clogged with dirt. Doing preventive inspections at high frequencies may be a small price to pay to ensure that expensive breakdowns do not occur.

-- While our consultant noted that it is generally not cost-effective nor useful to do preventive maintenance on window air conditioners, unusual circumstances at the University may make small repairs more cost-effective than replacement. Specifically, most of the University's air conditioners are mounted inside of buildings in specially-tailored frames costing about $1,000 each. It is usually cheaper to maintain an old unit than to purchase a new one and fabricate a new frame.

-- Some building users, particularly those involved in research, cannot afford to have equipment breakdowns of any sort. Thus, they demand a higher level of service on equipment than might be necessary for similar equipment in other buildings.

Whether the shops are doing an appropriate amount of preventive maintenance depends on more than just the maintenance schedules they have established. It also depends on whether the shops follow the schedule in practice. From our review of Physical Plant shop tickets closed during February and May 1988, we found that:

- The shops close about 18 percent of the preventive maintenance tickets without doing the scheduled work.[13]

We wondered whether the failure to do this maintenance might result in serious consequences. Our consultant evaluated a representative sample of shop tickets closed during one month without being done and concluded that the shops' failure to do all of the scheduled preventive maintenance work probably had little effect on the useful life of the equipment or the safety of building users.

There were a few exceptions. For example, the electrical shop did not conduct a scheduled test of a fire alarm system, nor did it perform a quarterly inspection of PCB

transformers. Failure to do either activity could affect the safety of building users. However, our consultant reported that most of the uncompleted activities were either unnecessary or could be skipped for a month without serious effects.

To further determine if the shops adequately maintain equipment on the preventive maintenance inventory, our consultants made on-site inspections of 49 equipment items. They found that:

- Equipment in the preventive maintenance inventory appears to be in reasonably good condition.

The consultants rated 35 items in "good" condition, 13 in "fair," and one in "poor." Direct observations indicated that Physical Plant services much of the equipment at frequencies less than scheduled, with little apparent effect.

Overall, it is difficult to generalize about the appropriateness of Physical Plant's preventive maintenance schedule, although it is clear that many items are not serviced as often as scheduled. There is a need for staff within Physical Plant to review the frequency of current activities and consider the circumstances in which such maintenance is cost-effective. As noted in the next section, however, Physical Plant lacks good management information that could help in such a review.

3. Management of the Preventive Maintenance System

Due to its routine and repetitive nature, preventive maintenance receives less attention than other types of maintenance in many physical plant operations. But because of its potential for long-term cost savings, effective preventive maintenance should be a priority of plant managers.

The University of Minnesota has a good start on its preventive maintenance program. It has a lengthy inventory of preventive maintenance activities and frequencies, and nearly 20 years of experience in performing these tasks. However, we found that:

- Physical Plant has practically no means of managing its preventive maintenance program or determining its cost-effectiveness.

Physical Plant's preventive maintenance system lacks the following characteristics that would allow it to be more effectively managed:

-- *Time estimates for planning and performance measurement.* None of the preventive maintenance activities we reviewed had time estimates, despite the fact that they are recurring and could be scheduled in advance.[14]

-- *Equipment records.* Of the eight shops we reviewed, only one reviews historical records of equipment maintenance to identify important trends. In fact, none of the shops keep copies of their preventive maintenance shop tickets. Most information about equipment maintenance is recorded manually, and there are no central files that allow shops to know what maintenance has been done by other shops on a given piece of equipment. Physical Plant cannot determine the effectiveness of its preventive maintenance program without accurate equipment histories.

-- *Balanced workload.* To the extent possible, organizations should distribute their preventive maintenance activities evenly during the year. If an organization schedules too many activities at one time of the year, there may not be staff available to perform all the work. For the most part, Physical Plant has not tried to balance its workload.

-- *Computer system capable of producing useful management reports.* Data for Physical Plant's preventive maintenance system is on a central University computer system, not a Physical Plant system. Physical Plant staff told us they have been unable to obtain management information from the system in a timely, cost-effective manner.

-- *Maintenance checklists.* While Physical Plant's shop tickets identify the equipment to be maintained and its location, the tickets do not contain "checklists" of maintenance activities to perform. Such checklists would make expectations clear to workers and would provide a means of recording work performed.

We learned that there is little scrutiny of the preventive maintenance system's costs. Shop foremen told us that it is not unusual to charge the costs of other jobs to preventive maintenance tickets. They saw little harm in this, since they perceived that funding for these activities all comes out of one budget. However, this practice erodes the system's accountability, making performance measurement nearly impossible.

Despite the recent interest of some Physical Plant staff in improving management of the preventive maintenance system, there has been little progress. In 1986, the plant engineers proposed to Physical Plant's director that they be given responsibility for monitoring equipment service levels. They believed that having the shops set service frequencies created a potential conflict of interest, since the shops could "create" preventive maintenance work to avoid layoffs. The engineers received no response to their proposal. In early 1988, Physical Plant's Work Control unit started analyzing the preventive maintenance system and hired a staff person to do this full-time. However, these efforts have been undermined by the system's uncertain position within the organization. Plant engineers, shop foremen, and area managers have engaged in a struggle for control of the preventive maintenance system, and Physical Plant management has not provided the program with clear direction.

E. TRANSPORTATION

Maintenance work requires the transportation of workers and materials to job sites. An efficient transportation system minimizes the time spent getting to the job site and maximizes the time available to do the work. In this section, we review Physical Plant's transportation system. We base our analysis on extensive interviews with Physical Plant management and staff, responses to our employee survey, a telephone survey of physical plant directors at Big Ten universities and other large institutions, and a review and analysis of Physical Plant transportation studies.

1. Organization

Physical Plant established its Transportation Services Division in January 1988 to consolidate transportation functions previously assigned to other Physical Plant divisions. The division's primary responsibilities are to manage the department's vehicles and transportation equipment and to transport maintenance workers and equipment to job sites.

PPO currently leases 61 vehicles from the University's centralized Vehicle Fleet Services department, which also maintains the vehicles. The Transportation Services Division uses 21 of these vehicles, including eight vans, four pick-ups, and nine *stake trucks* as the principal means of getting workers and material to work sites.[15] The remaining vehicles are assigned to other Physical Plant divisions. There are currently 23 drivers assigned to division vehicles plus four students hired during the summer to fill in for regular drivers on vacation.

Physical Plant also owns 77 pieces of heavy equipment. Most are used by the Heating Plant, Environmental, and Custodial and Grounds Divisions. The Transportation Services Division maintains and repairs all heavy equipment and procures new equipment when necessary.

2. Getting Workers and Materials to Job Sites

Early in our study, we heard many concerns raised by Physical Plant staff about the efficiency of the system used to transport workers and materials to job sites. This section summarizes what we learned about (1) how much time workers spend waiting for vehicles, (2) the way Physical Plant currently uses vehicles, and (3) how Physical Plant management has responded to concerns about the transportation system.

PPO pays each of its 23 drivers about $23,000 per year plus fringe benefits and payroll taxes. Five of these drivers transport trade workers to work sites in 12-passenger vans. Three vans serve Minneapolis shops and two serve St. Paul. Workers going from the shops to a job site can board a van at the Shops Building yard, although they may have to wait a few minutes for a van to return from the field. Workers returning to the shops building or going from one job site to another must telephone the dispatcher to request a ride. Trade workers must request a stake truck to pick up and deliver materials to a job site.

In our employee survey, we asked several questions about Physical Plant's transportation system. Over half of the respondents said they often or usually have to wait too long for rides. (See Table 4.2.) On average, those workers who use the vans reported waiting 19 minutes per ride. Table 4.7 summarizes the amount of time workers say they spend waiting for rides and riding to work sites per week. Data are presented for those workers who said they ride at least once per week. On average, workers reported waiting 111 minutes per week for rides and riding in vans 66 minutes per week. This amounts to 4.6 percent of a 40-hour work week waiting for rides and 2.8 per cent riding.

TABLE 4.7

TIME SPENT GETTING TO AND FROM WORK[a]

	Number of Responses	Percent of Responses
WAITING FOR RIDES		
0 Minutes Per Week	48	33%
1-30 Minutes Per Week	27	18
31-60 Minutes Per Week	17	12
61-120 Minutes Per Week	13	9
121-180 Minutes Per Week	12	8
More Than 180 Minutes Per Week	29	20
Total	146	100%
Average waiting time: 111 minutes per week.		
RIDING		
0 Minutes Per Week	44	30%
1-30 Minutes Per Week	38	26
31-60 Minutes Per Week	31	21
61-120 Minutes Per Week	18	12
121-180 Minutes Per Week	4	3
More Than 180 Minutes Per Week	12	8
Total	147	100%
Average riding time: 66 minutes per week.		
Average time spent getting to and from job sites (waiting plus riding): 177 minutes per week.		

Source: Office of the Legislative Auditor survey of 211 shop workers, May 1988.

[a]Based on those workers who report using the vans at least once per week.

Given that one third of the workers who ride vehicles reported no waiting time and 30 percent reported no riding time at all, the average times reported above may underestimate actual waiting and riding times. On the other hand, 20 percent of the workers reported waiting for rides over 180 minutes (three hours) per week (7.5 percent of a 40-hour week). Responses vary according to shop since some shops use the transportation system more than others. For example, Health Science workers rarely need rides since most of their work is within close proximity of their shops. Some of the other shops have their own service vehicles and are less apt to use the vans.

A recent study by the Transportation Services Division of dispatched van and truck rides in Minneapolis from September 21 through October 16, 1987, revealed that 23 per cent of the pick-ups and 42 percent of the drop-offs were at the main shops building.[16] The study noted that dispatcher logs underestimate the pick-ups figure because workers sometimes wait for rides in the lot without calling the dispatcher. As a result of this finding, the study recommended that Physical Plant should establish route systems for main traffic patterns from the shops building to several key drop-off points and back.

Physical Plant recently implemented such a system in Minneapolis. Vans follow scheduled routes between 8:00 and 9:00 AM and 4:00 and 4:30 PM. Physical Plant reports that, in May and June 1988, scheduled vans carried an average of only one or two riders on their morning routes. Although scheduled routes have the potential to increase efficiency by reducing waiting time and increasing the number of riders per trip, trade workers are not using them in sufficient numbers to realize that potential.

While the route system could probably be improved, such a system only serves workers during limited parts of the day. For most jobs, workers could get to job sites sooner if they transported themselves, either by walking or driving themselves. This would increase the productivity of the shops by eliminating waiting time.

The efficiency of Physical Plant's transportation system depends, in part, on the manner in which it is used and the alternatives available to Physical Plant. For example, a reasonable transportation system should encourage walking to work sites when appropriate. From Physical Plant data on pick-up and drop-off points for dispatched rides, we determined that:

- In about half of the cases, riders could have walked to their destination in 10 minutes or less. In about 70 percent of the cases, riders could have walked to their destination within 15 minutes.[17]

In some instances, adverse weather makes walking inadvisable. Also, workers sometimes have to haul heavy tool boxes or other materials. Our informal observations indicate, however, that most van riders do not haul heavy materials.

The St. Paul shops have divided the campus into four zones and instituted a policy that workers are to walk to and from job sites within the same or adjacent zone. Minneapolis shops have no such policy on walking. Furthermore, shop foremen and Transportation Services Division personnel tell us that workers rarely use the free intracampus bus system. This system could be particularly useful for trips from the shops building to the West Bank. We conclude, therefore, that:

- Physical Plant could reduce (but not eliminate) its need for delivery service drivers and vehicles if more trade workers walked to their work sites and used the intracampus bus system.

The types of vehicles used by Physical Plant also affects the transportation system's efficiency. The study by Physical Plant's Transportation Services Division (cited earlier) found that 92 percent of the van trips carried fewer than three people. This was before the morning and afternoon scheduled routes were instituted. Therefore, it appears that Physical Plant could save money by substituting smaller vehicles for its 12-passenger vans.

The division study also found that only 53 percent of the trips by stake trucks are for large materials that require such a truck. The study suggested that some of the stake trucks could be replaced by smaller vehicles, which would cost less to lease, be more economical to operate, and take up less space.

In addition, the Transportation Services Division study suggested that individual shops be assigned more vehicles to use to transport personnel to jobs in emergencies and to carry small materials. This suggestion was not new. In October 1986, Physical Plant's director asked three of his division heads to review the system for transporting workers and materials and suggest more efficient alternatives. An assistant director responded with a memo suggesting several changes.[18] The assistant director recommended: (1) assigning 11 more pick-up trucks to the shops so that trade workers could drive themselves when possible, (2) requiring workers to drive themselves to off-campus locations and vendors, (3) encouraging workers to walk short distances, (4) requiring a two-hour notice for scheduling stake trucks for large loads, and (5) eliminating four trucks, two vans, and their drivers. These recommendations were never implemented, nor has Physical Plant taken action (other than the scheduled routes) to implement similar recommendations from its most recent study. We conclude, therefore, that:

- Although Physical Plant has been aware for some time of the shortcomings of its current transportation system, it has not acted on many recommendations that could reduce cost and improve efficiency.

3. Parking and Union Contracts

Physical Plant management gives two reasons for its system of using delivery service drivers to transport workers to their jobs. The first is the lack of sufficient parking space on the University campus. The second is the implicit understanding between management and workers that only Teamsters Union drivers may transport workers to their work sites.

The University of Minnesota is not unique in having difficulties finding sufficient parking space for its maintenance workers. In order to assess the reasonableness of using delivery service drivers to transport workers, we surveyed physical plant directors of other Big 10 universities to see how they handle parking problems. We also surveyed physical plant directors at all of the University of Minnesota's coordinate campuses, Mankato State and St. Cloud State Universities, Minneapolis Public Schools, the state of Minnesota, Ramsey County, 3M, and Honeywell. Finally, we discussed several options with staff from University of Minnesota Parking Services.

With one exception, all Big 10 physical plants have trucks, usually pickups, assigned to individual shops which are used to transport people and material to job sites.[19] All physical plants use loading zones or specially assigned spaces to park near the job sites. At some institutions, workers carry pagers to notify them if they need to move their truck from a loading zone to accomodate a delivery. With the exception of Ohio State, which has loading zones at every building, all Big Ten universities report that the number of loading zones and special parking spaces is insufficient or that not all buildings are accessible from them. As a result, six of the other nine Big Ten physical plants provide some kind of dispatched van service to get workers to job sites.

Parking is not a problem at the coordinate campuses, Honeywell, Ramsey County, or the Minneapolis schools. Mankato State University, St. Cloud State University, and the state of Minnesota report some parking problems. Workers at these three institutions drive service vehicles to work sites and use designated parking spaces. 3M has two vans that carry workers and materials, and workers can drive themselves. Minneapolis schools have six drivers and 14 laborers that deliver materials to job sites throughout the city.

In summary:

- At most institutions where parking is a problem, trade workers drive themselves and their material to the job sites and park in designated areas. However, most Big 10 universities also provide dispatched vans or buses for workers without adequate access to work sites.

We contacted University of Minnesota Parking Services about the parking options available to Physical Plant. There are 91 "service vehicle spaces" available on both campuses for Physical Plant vehicles. There are also "official university vehicle spaces" where Physical Plant vehicles could park for up to two hours. In addition, there are almost 15,000 parking spots in garages and parking lots. The lots are generally too far from the major buildings to be helpful, but Physical Plant could use the garages in some instances. However, we found that:

- For the most part, Physical Plant does not use designated spaces or contract for spots in garages. Physical Plant currently leases only two spots in the Mayo Garage in the Health Sciences complex.

In addition to the parking problem, Physical Plant management cites the jurisdictional divisions among unions as a reason for using Teamster drivers to drive trade workers and materials to job sites. Just as only carpenters can do carpentry work and only electricians can do electrical work, there is an understanding that all driving is to be done by Teamsters. In fact, grievances have been filed by the Teamsters Union when shop foremen or others have driven workers or materials to work sites. At a June 1988 meeting between Physical Plant management and Teamster representatives, Physical Plant reaffirmed its policy of not permitting trade workers to be driven to job sites in vehicles assigned to the shops, except in very limited cases.

Our survey of other Big 10 universities found that:

- Minnesota is unique among Big 10 universities in requiring Teamster drivers to transport workers and materials to job sites.

Illinois employs Teamsters to transport material in trucks, but none of the institutions we surveyed prohibit trade workers from driving themselves to job sites.[20]

Physical Plant management and Teamster officials note that it is cheaper to pay Teamsters to drive ($11.07 per hour) than trade workers ($18 to $25 per hour). However, it is not cost-effective to employ Teamsters to transport workers to job sites if the workers could drive themselves. If more than one worker is going to the same general area, they could drive together in a pickup or station wagon. And while it is not cost-effective for shop foremen to be full-time chauffeurs, there may be occasions where it is beneficial for them to drive workers to work sites or perform other errands. In short:

- Physical Plant could reduce the number of its service delivery drivers if it increased the number of vehicles assigned to certain shops, relaxed its restrictions for driving those vehicles, and made arrangements for parking vehicles in garages or designated parking spaces. Allowing workers to drive themselves to job sites would increase productivity for those shops that use the transportation system by reducing the time spent waiting for rides.

F. WORK QUALITY AND CUSTOMER SATISFACTION

1. Technical Quality

To determine the cost-effectiveness of Physical Plant's work, it is important to consider the technical quality of work completed. Although Physical Plant's labor costs are higher than those of many comparable institutions, these costs should be weighed against Physical Plant's work quality.

In our employee survey, 89 percent of shop workers said their work quality is "usually or always" better than the work of private contractors. Another 7 percent said that Physical Plant's work is "often" better than private work.

Unfortunately, there is no easy way to make a direct comparison between the quality of Physical Plant and private labor. However, one of our consultants conducted on-site inspections of 40 projects recently completed by Physical Plant shops.[21] From this sample, we found that:

- The quality of work done by Physical Plant shops is consistently high.

In no cases did our consultants express concerns about the technical quality of work by Physical Plant shops. The workers assigned to projects always had the skill levels needed to do the work, and they did their work well. In interviews, we found the workers to be conscientious and proud of their work.

2. Customer Survey

Service providers, such as Physical Plant, should know how consumers rate their work in order to keep them happy. The Custodial and Grounds Division has a staff person assigned to contact users of custodial services and ask about work done for them. A customer service desk within the shops handles work requests and customer concerns.

For each of the 40 shop projects reviewed by our consultants, we identified a primary customer to be interviewed about service quality. The interviews were conducted by staff of the University of Minnesota Center for Survey Research, using an interview guide that we developed.[22]

Overall, we found:

- All but one of the users surveyed was satisfied with the work performed. Only a few said that they had actually observed shop workers on the job, but those who did rated the workers' productivity as good.

Similarly, virtually all users said that they were satisfied with the communication between them and the shops and the overall cooperation received from Physical Plant. Only one user said that she had to call back to request that the shop correct the original work, while another pointed out that the problem leading to the repair occurs frequently.

As was noted by our consultants, few of the users had seen any estimate of costs or time before work began, and were generally unaware of whether a project had been completed on time or within budget. None was aware of changes that might have occurred in the scope of the work. A few commented that they thought the price charged by Physical Plant was high.

G. RECOMMENDATIONS

It is difficult to estimate the productivity and efficiency of Physical Plant's shops with precision. In part, this is because the shops do not adequately document work completed. However, it is clear that there are many changes that could make the shops a more productive operation.

The shops do high quality work, but better scheduling and transportation could improve their efficiency. It is also clear that the cost of Physical Plant's labor is high relative to similar organizations.

We recommend that:

- Physical Plant's top management should clarify the roles of foremen and area managers and provide them with training to fulfill these roles.

The foremen need to spend more time "in the field." They should scope jobs, estimate time and costs, develop schedules, and document job performance. Most of the foremen lack the necessary training in supervision and scheduling. The area managers need more support from top management, including greater authority to plan, manage, and evaluate the work of the shops. However management defines the roles of foremen and area managers, it is clear that Physical Plant needs supervisors who are more accountable to management and more communicative with workers.

Development of a computerized maintenance information system should eventually help Physical Plant generate some useful management information. In the meantime, Physical Plant needs to improve its manual management systems. To improve planning, scheduling, accountability, and follow up, we recommend:

- Physical Plant should ensure that workers document work completed on shop tickets.

- The shops should strive to estimate a high percentage of their shop tickets with reasonable accuracy. For routine jobs, the shops should utilize accepted time standards to make estimates. The shops should use these estimates to schedule work assignments and evaluate performance.

- Physical Plant should encourage foremen to communicate expectations. When assigning work, foremen should provide employees with clearer indications of appropriate methods, materials, tools, and safety precautions.

- Physical Plant's shops should institute a regular employee evaluation schedule. As a more informal means of giving feedback to employees and allowing employees to voice concerns, the shops should schedule periodic employee meetings.

- To ensure consistency of practice among the shops and provide central guidance, Physical Plant management should develop a policy and procedures manual for the Twin Cities campus.

- The shops should keep an open inventory of small items on hand. They should use a formula to allocate charges for these items to all shop tickets.

- To encourage customers to contact Physical Plant's Customer Service Center rather than foremen, Physical Plant should not publicize phone numbers for its individual shops. Customer Service Center staff should be trained to ask customers questions and write shop tickets that more clearly identify the work required.

- To improve accountability and departmental communication, Physical Plant should ask each department to designate one person to submit all of that department's work requests.

It is clear to us that Physical Plant's shops are more specialized and expensive than similar operations elsewhere. We recommend:

- The University should review Physical Plant's current arrangement with the trades and seek ways to improve the cost-effectiveness and management of the shops.

There are various options that should be considered. For example, Physical Plant could use its specialized trade workers more efficiently by having general maintenance workers perform more routine jobs. Physical Plant might give general maintenance workers "permanent" assignments in specific buildings, where they could perform small repair and preventive maintenance jobs. In addition, the University should consider negotiating a more extensive, single contract with the trades to simplify labor relations. Physical Plant's 1987 master contract with the trades was a good first step toward easing individual trade contract restrictions, and we endorse further steps toward simplification. Also, if University officials believe that cost-effectiveness cannot be improved through renegotiation of the contract with the trades, they should consider making the trade workers University employees prior to the renegotiation.

Whatever employment approach the University uses, it should reconsider its policy of paying prevailing wages to shop workers, a policy that is unusual in the maintenance field and contributes to higher costs. While construction workers often receive prevailing wages to compensate for the sporadic nature of their work, it is unusual for maintenance workers to receive prevailing wages. Because of this policy, Physical Plant trade workers are paid significantly more than workers doing comparable jobs elsewhere.

To improve Physical Plant's management of staff levels, we recommend:

- Physical Plant should monitor backlog routinely and develop guidelines for acceptable backlog levels.

To improve Physical Plant's preventive maintenance program, we recommend:

- Physical Plant management should develop central policies for inclusion of activities in the preventive maintenance schedule. Before developing these policies, Physical Plant should solicit input from representatives of the management, shops, and plant engineering functions. Physical Plant should also consider the instances in which departments should be billed for preventive maintenance services.

- Physical Plant management should clarify the roles and authority of plant engineers, shop foremen, and area managers with regard to the preventive maintenance system.

- Physical Plant should review activities on its current preventive maintenance schedule, eliminating or adding activities based on cost-effectiveness.

- Physical Plant should more effectively manage the preventive maintenance program by (1) estimating job times, (2) keeping better equipment maintenance records, (3) balancing work schedules, (4) obtaining more useable computer services, and (5) placing maintenance checklists on preventive maintenance shop tickets.

Physical Plant's system for getting trade workers to their jobs is inefficient and time-consuming, resulting in increased costs and reduced productivity. The lack of adequate parking within the University and the jurisdictional divisions among unions are important reasons for Physical Plant's current system. However, there are measures that Physical Plant could take to improve its transportation system. Although creation of the Transportation Services Division seemed like a promising way to give transportation issues more visibility and attention, Physical Plant management has not provided adequate leadership to make its transportation system more efficient.

To address inefficiencies in Physical Plant's transportation system, we recommend:

- Physical Plant should permit workers to drive themselves and co-workers to work sites, and it should consider purchasing additional vehicles for the shops.

- Physical Plant should institute a policy requiring that Minneapolis campus workers walk or take the intracampus bus for short trips wherever possible, rather than using the van service.

- Physical Plant should use available parking spaces on campus and evaluate the need to lease more spaces in parking garages.

- Physical Plant should consider replacing 12-passenger vans with smaller vehicles. Physical Plant should reduce its number of stake trucks and drivers, and transport more materials in smaller vehicles.

- In future contract negotiations, Physical Plant should consider the option of staggering the times when workers in various shops begin and end work, to reduce waiting times for vehicles, materials, and tools.

FOOTNOTES

[1]Keith-Stevens, Incorporated of Eden Prairie, Minnesota.

[2]Applied Management Engineering of Virginia Beach, Virginia.

[3]William Thomas, "University of Minnesota Physical Plant Operations Commitment to Focus Planning Report," June 1987.

[4]The estimate came from a survey developed by the H.B. Maynard Company of Pittsburgh. The study assumed that even a well-managed organization cannot have 100 percent productivity because of inherent, normal delays in maintenance practices, such as travel time and the need to coordinate jobs.

[5] David R. Howard, "Overview of Maintenance Management," *Facilities Management: A Manual for Plant Administration* (Teresa Burnau Evans, ed.), 1984, p. III-17.

[6]Based on recommendations from a report by the Loren Olsen Company of Minneapolis, Physical Plant started to generate ongoing reports on "open" and "closed" shop tickets.

[7]Depending on the relationship of the foreman with the union hall and rules about seniority-based layoff lists, it may be difficult to rehire the same worker (or to assure a different one if dissatisfied with the first) later.

[8]Lawrence Mann Jr., *Maintenance Management*, (Lexington: D.C. Heath and Company, 1983), p. 5.

[9]At the hospital, they are classified as Hospital Maintenance and Operations Mechanics and are specially trained to handle maintenance situations unique to the hospital.

[10]The University of Minnesota-Duluth does have trade electricians on staff because of an electricians' local there.

[11]*Minn. Stat.*, §179A.10.

[12]In our interviews, we learned of other items that may need more preventive maintenance. For example, Physical Plant is just starting to schedule preventive maintenance for equipment in the University's heating plants. Also, some Physical Plant staff suggested that refrigeration absorbers should be overhauled each year.)

[13]We examined data on closed shop tickets to determine the percentage closed with no labor hours charged.

[14]Physical Plant has developed a "schedule forecast" that shows the number of preventive maintenance hours that each shop will likely encounter in a given month. However, the forecasts are based on actual times logged for these activities in the past, not on engineering estimates of appropriate times.

[15]Stake trucks are flatbed trucks used to haul material to work sites.

FOOTNOTES (con't)

[16]Janet Tourville, "Transportation Analysis for Physical Plant," December 1987.

[17]The Transportation Services Division study divided the Minneapolis campus into zones and recorded the zone of each pick-up and drop-off. Our conclusions are based upon walking times between zones.

[18]Memorandum from Paul Phillips to Charles Bailey, "Proposed Changes to Our Trucking Shop," November 25, 1986.

[19]At Northwestern University, workers drive their own cars or trucks and are reimbursed for mileage.

[20]The University of Illinois contracts with the University's transportation system for its van service.

[21]Keith-Stevens, Incorporated.

[22]They completed 29 interviews, including four with Physical Plant custodians who had initiated the repair call. They did not conduct interviews in several other cases where the shop ticket was initiated by a shop manager and it was not possible to identify a user.

CUSTODIAL AND GROUNDS MAINTENANCE OPERATIONS

Chapter 5

Custodial work and grounds maintenance are perhaps the most visible tasks of Physical Plant Operations. The University's appearance and cleanliness depend on the effectiveness of these activities. Custodial staffing has fluctuated in recent years, affecting the service levels provided to University users. We asked:

- How does the University of Minnesota's staffing for custodial and grounds maintenance compare to other Big 10 universities?
- Do University of Minnesota custodians have comparable workloads?
- Is the University clean, and are desired levels of service met?
- Is the custodial work force efficient and cost-effective?

To address these questions, we interviewed Physical Plant managers, administered an employee survey (discussed earlier), and reviewed literature on custodial management practices. We also hired a consultant to help us address technical questions related to staffing, cleaning methods, and equipment.[1] We selected 12 buildings that are generally representative of the type of facilities at the Twin Cities campuses, and our consultant reviewed the custodial practices of at least one worker in each. The consultant (1) estimated the time required to meet current service levels in each facility, (2) interviewed custodians, supervisors, and building users, and (3) evaluated the work practices of custodians in each location.

In general, our assessment of the University's custodial operation is positive. From our small sample, the custodians appear to be using appropriate work practices and doing a good job of cleaning. While the University should consider formalizing its training programs and service levels in order to give employees clearer work expectations, it is doubtful that this would result in large improvements over current productivity. We found some evidence of workload imbalances that we think Physical Plant should examine on a broader scale.

A. STAFFING

The Custodial and Grounds Division is the largest of Physical Plant's nine divisions. As of June 1988, it employed 429 full-time and 168 part-time custodians, in addition to 37 supervisors. Nearly 90 percent of the custodians work evenings, usually from 4 to 12

p.m. The grounds crew consists of 10 full-time workers, about 30 half-time workers in the summer, and three supervisors.

1. Custodial

To evaluate Physical Plant's custodial staffing, we began by comparing its total staffing to other universities. We found that:

- The University of Minnesota employs more custodians than any other Big 10 school, but the amount of space Minnesota assigns to each custodian is about average for Big 10 schools.

Table 5.1 shows current Big 10 staffing. According to 1984-85 staffing data collected by the Association of Physical Plant Administrators for Universities and Colleges (APPA), the size of Minnesota's custodial work force ranked second nationally to the University of Texas among 400 surveyed institutions.

TABLE 5.1

CUSTODIAL STAFFING AT BIG 10 UNIVERSITIES

University	Full-Time Employees	Part-Time or Seasonal Employees	Square Footage Served[a]	Approximate Square Footage Per Full-Time-Equivalent Custodian
MINNESOTA	**429**	**170 half-time**	**12.0 million**	**23,350**
Purdue	255	20-50 half-time	7.1 million	25,350
Northwestern	101	0	3.9 million	38,600
Ohio State	213	6 half-time	4.6 million	21,300
Michigan State	190	200 half-time, up to 20 temporaries	9.4 million	31,300
Indiana	324	20-50 half-time	6.3 million	18,100
Michigan	352	0	9.5 million	27,000
Wisconsin	480	6 half-time	10.8 million	22,400
Iowa	213	24 half-time	5.6 million	24,900
Illinois	318	195 half-time (full-time in summer)	9.3 million	22,400

Source: Employee estimates came from phone contacts with each university. Square footage estimates came from phone contacts or the Association of Physical Plant Administrators' *Comparative Costs and Staffing Report for 1984-85.*

[a]The estimates for Minnesota, Northwestern, Ohio State, and Wisconsin came from direct contacts with the universities. The square footage shown for Ohio State is that maintained by its in-house custodians. Ohio State contracts out 45 percent of its custodial work.

Currently, the full-time equivalent of about 515 custodians clean Minnesota building space totalling 12 million square feet, for an average of about 23,300 feet of space per custodian. This is sixth highest among the Big 10 schools, which range from 18,300 square feet per custodian (Indiana) to 38,600 square feet per custodian (Northwestern). Minnesota's building space per custodian represents about the median staffing level when compared to 1984-85 staffing at 40 American and Canadian universities and colleges with at least 20,000 students.[2]

In our review of literature, we found many suggested staffing guidelines based on building square footage. For example, according to a 1984 source, Florida allocates funds to state universities based on the assumption of one custodian per 12,000 square feet. Texas uses a standard of one custodian per 14,000 square feet, and Washington funds one custodian per 20,000 square feet.[3] The head of the University of Minnesota's custodial division advocates one employee per 32,000 square feet of general space, and one per 16,000 square feet of health sciences areas.[4]

Ultimately, however, the staffing requirements of an institution depend on the levels of service expected. For example, custodians expected to empty waste baskets and vacuum floors each day can clean fewer offices than custodians who are only expected to empty waste baskets. Thus, rather than basing our judgements about the University of Minnesota on gross measures of square footage per custodian, we examined the adequacy of custodial staffing for the University's currently specified service levels.

We randomly selected eleven custodial work assignments at the University of Minnesota, as described in Appendix B. In each case, our consultant applied accepted industry time standards to each cleaning task specified for the work area. While it was sometimes difficult to exactly match Physical Plant's service levels to our consultant's time standards, we found that:

- In 10 out of 11 cases, Physical Plant assigned custodians more than eight hours of work per day.

- Based on our small sample, work assignments do not appear to be balanced among custodians.

Our consultant estimated that it would take an average of about 11.2 hours to meet the specified service levels in the 11 buildings. We found considerable range in the amount of time required to maintain work areas to current service levels, as shown in Table 5.2. The assignment given to a custodian in Blegen Hall required about six hours of work during an eight-hour shift. In contrast, the assignment for three other employees required more than 14 hours of work each. For most of the work areas reviewed, specified levels of service were not being fully met. However, as we discuss in a later section, failure to meet these service levels is not necessarily a problem, since some of Physical Plant's service levels are unrealistic.

From the sample we reviewed, it is not possible to determine whether the observed workload imbalances are widespread at the University. However, our survey of 184 custodians indicated that 52 percent believe their schedules and workloads are "usually or always" reasonable, while 17 percent responded "often," 16 percent responded "sometimes," and 7 percent responded "rarely or never."

TABLE 5.2

CUSTODIAL WORKLOADS IN ELEVEN BUILDINGS

Site of Work Assignment Reviewed	Total Square Feet Assigned to the Worker Reviewed	Total Hours Required to Meet Written Service Levels[a]
Lind Hall	11,225	10.6
Physics Building	21,906	14.6
Heart Hospital	12,984	9.2
Mayo Building	16,204	11.6
Moos Tower	14,201	15.6
Phillip-Wangenstein Building	12,634	9.1
Phillip-Wangenstein Building	11,138	8.9
Civil/Mineral Engineering Building	28,278	15.8
Management/Economics Building	15,694	10.3
Blegen Hall	8,077	6.4
Veterinary Science Building	15,916	10.7
AVERAGE	15,296	11.2

Source: Institute for Building Maintenance Technology's analysis of 11 work assignments, June 1988.

[a]The times shown include set-up and clean-up time, 30 minutes for breaks and 30 minutes for lunch. These times should be compared to an eight-hour working day, since most Physical Plant custodians are paid for seven productive work hours plus one hour for breaks.

Physical Plant makes staffing assignments based largely on general rules of thumb for appropriate square footages per custodian (such as those cited earlier). These may be modified by supervisors' observations on the type and amount of building use. As noted later, specified service levels do not vary much from one location to the next. This method of staffing is administratively simple, but its insensitivity to the unique cleaning requirements of individual work areas may occasionally contribute to the sort of work imbalances noted in our sample.

A final issue is the University's lack of weekend staff. Physical Plant operates on a Monday to Friday custodial work schedule, even though some campus buildings have heavy weekend use. Physical Plant employs only about 2.5 full-time-equivalent custodians on weekends, and these workers spend considerable time locking and unlocking doors for building users, rather than cleaning. Consequently, according to some building users we talked with, high traffic portions of buildings are sometimes quite dirty by Monday.

2. Grounds

A university's physical surroundings significantly affect its public perception. Students, faculty, and staff take pride in well-kept campuses, and a visitor's impression of a university may come more from its physical appearance than its other characteristics.

Recently, there has been concern about the appearance of the University of Minnesota's Twin Cities campus. In 1986, President Kenneth Keller appointed an Environmental Advisory Committee to plan the future of the campus.[5] In a letter to committee members, President Keller summarized concerns about campus appearance:

> At (the University of Minnesota's coordinate campuses), we have campuses that look good and speak well for the University. Unfortunately, the Twin Cities campus, and particularly the East and West Bank parts of it, do not do as well."[6]

President Keller attributed the condition of the Twin Cities campus to its age, its dense student population, and retrenchments in the early 1980s that caused the University to "abandon any careful, orderly plan of landscape development or maintenance."

We wondered how the University of Minnesota's staffing for grounds maintenance compared to similar universities, so we contacted other Big 10 Conference schools. As shown in Table 5.3, we found that:

- The University of Minnesota employs a smaller grounds maintenance staff than most other Big 10 schools, both in full-time and seasonal staff.

During the summer months, the University of Minnesota has fewer full-time-equivalent employees than all other schools. During the rest of the year, only the University of Iowa has a full-time grounds crew similar in size to Minnesota's.

Because University campuses differ so much, it is difficult to determine an optimum number of grounds staff per acre. For example, campuses with large amounts of open space do not require as many workers as similar-sized campuses with extensive gardening or landscaping. Also, buildings occupy much of the campus acreage on a dense, urban campus like Minnesota's, in contrast to the spacious campuses found in more rural settings. However, because Minnesota's staffing seems to be clearly lower than several other Big 10 schools, we think that inadequate grounds staffing should be considered one possible explanation for the condition of the Twin Cities campus. The University's of Minnesota's head of grounds maintenance also told us that, until recently, it was not unusual for his workers to be assigned to tasks unrelated to grounds, such as furniture moving and running errands for academic departments.

Curiously, a committee devoted to improving campus appearance recently failed to act on a proposal for additional Physical Plant grounds funding. In March 1988, the University's Vice President for Finance and Physical Planning approved "a recurring budget allocation of $190,370 to Physical Plant Operations for Campus Beautification effective April 1, 1988."[7] Before spending the funds, the Vice President required approval of Physical Plant spending plans by the University's Landscape Technical Advisory Committee for Campus Beautification. However, the committee did not act on the issue at its May 1988 meeting, and there have been no expenditures of the funds. Conceivably, the funds could be used to make additions to the University's relatively small grounds work force.

TABLE 5.3

COMPARISON OF GROUNDS MAINTENANCE STAFFING
AT BIG 10 UNIVERSITIES

University	Full-Time, Year-Round Grounds Workers[a]	Summer Workers	Campus Area (Acres)
MINNESOTA	**10**	**40 half-time**	**980 total, 500 receive intensive maintenance**
Ohio State	30	40 full-time	4,000 total, 1,500 receive intensive maintenance
Michigan	29	100 mostly full-time	1,150 acres, 150 receive intensive maintenance
Michigan State	23	30-35 full-time	1,000
Purdue	23	40 full-time	400--main campus
Northwestern	16	32 full-time	220--main campus
Iowa	11	30 full-time	900 total, 500 receive intensive maintenance
Indiana	41	40 full-time	2,000 total, 500 main campus
Illinois	41	40 full-time	860

Source: Office of the Legislative Auditor contacts with Big 10 universities.

[a]Excludes supervisors, garbage haulers, and people who maintain athletic facilities, golf courses, or parking facilities.

B. OTHER ISSUES

1. Clarity of Custodial Service Levels

Unlike many institutions, the University of Minnesota's Custodial Division has established "levels of service" for all of its assigned work areas. For example, the written service levels for office buildings call for daily trash pick-ups, restroom cleaning, and damp mopping of stairways, among other tasks. Physical Plant expects its custodians to clean office sinks and mirrors twice a week and to spot clean office walls once a month. For some activities (such as carpet shampooing), Physical Plant charges departments who request more frequent service than specified in the service levels.

Minnesota's service levels are clearly specified, but they are not always communicated effectively to custodians. Custodians receive assignment sheets showing the rooms and building areas they are responsible for. But only a few of the 11 custodians interviewed by our consultant had seen the written descriptions of expected service levels, and none had a copy. In our employee survey, 36 percent of custodians said that their direct supervisors "sometimes, rarely, or never" make expectations clear to them.

We also found that:

- Physical Plant's written service levels have not been tailored to individual buildings or work areas, nor do they include time standards for work completion.

Physical Plant's service levels are generic. There are different service levels for Health Sciences buildings than other buildings, but there are no other variations from one location to the next. While it makes sense for Physical Plant to use consistent cleaning levels for similar building areas, the lack of site-specific service levels may contribute to the unbalanced workloads or unclear cleaning expectations we noted earlier. Having supervisors develop site-specific service levels with clear time expectations might reveal unique circumstances that warrant workload adjustments. Such standards would also clarify management's expectations of workers.

2. Employee Efficiency and Cost-Effectiveness

Our custodial consultant observed the work practices of custodians and supervisors in 12 buildings. The consultant also spoke to the building users in most of these locations. The observations of our consultant and discussions with building users indicated that:

- The custodians in our sample were productive and cleaned their work areas adequately.

To say that the custodians cleaned work areas "adequately" is not to say that they met existing service levels. Our consultant felt that some service levels were excessive. For example, there is usually no need to wet mop floors daily, as called for in the service levels for some areas. If done (and it usually is not), such an activity would add an average of about two hours daily to the work areas we examined. Our consultant also felt that some activities, such as interior window cleaning, are not scheduled often enough.[8] On balance, however, our consultant commented that the University's cleanliness seemed as good or better than that observed in other public school settings.

The main exceptions noted by our consultant and building users were (a) the lack of weekend cleaning, and (b) the lack of adequate back-up staff when regular employees are absent.

According to our consultant:

- The University custodians used appropriate cleaning methods, supplies, and equipment in all cases observed.

We found that Physical Plant has a useful, written training manual for custodians, although none of the custodians we interviewed had a copy. Since employees used appropriate methods in the cases we observed, it appears that there was adequate communication of proper methods, even if it was not in written form or in formal training courses. The one equipment problem, noted both by surveyed employees and our consultant, was the absence of back-up equipment.

In addition to work practices, labor costs also affect an operation's cost-effectiveness. We found that:

- The University's custodial wage rates appear to be competitive with other public and private Twin Cities employers.

We examined an annual survey of Twin Cities salaries.[9] According to the survey, the University's average hourly custodial salary in 1987 was $8.73. This compared to $8.75 for the State of Minnesota and an average of $8.94 for Twin Cities public employers. The survey indicated that 108 "leading companies" in the Twin Cities paid average custodial salaries of $8.53.

3. "Deep Cleaning" Crew

The University of Minnesota, like many other universities, faced budget problems during the early 1980s. The University eliminated more than 150 full-time-equivalent custodial positions between 1981 and 1983, and Physical Plant has only recently regained 1981 staffing levels. In the intervening years, the University met its budget partly by letting its buildings become dirtier.

In response, Physical Plant established a special project crew in 1986 to do "deep cleaning" in University buildings. This crew of 20 part-time custodians (called the "Dirtbusters") cleans one building from top to bottom before moving to another building. The Dirtbusters clean buildings to higher service levels than regular custodians.

Building users told us they liked this intensive cleaning program and our consultant observed that workers were productive and used appropriate methods. However, we also found that:

- At their current rate of cleaning and staffing, the "deep cleaning" crews will be able to clean the entire University only once every 17 to 24 years.

Between December 1986 and June 1988, the Dirtbusters cleaned four buildings totalling about 740,000 square feet. At this rate, the crew could clean the University's 12 million square feet over a 24-year period. Recently, the crew cleaned a large facility (Wilson Library) at a faster pace, requiring six months to clean nearly 390,000 square feet.

The deep cleaning crew appears to be a good public relations tool that makes customers very pleased. However, we question the practical value of providing intensive cleaning service on such an infrequent basis.

4. Division Management

It is apparent to us that managers in the Custodial Division have made some strong efforts to develop an efficient and effective organization. While we think that the division's documentation of service levels and its supervisory training programs need some improvement, we also think it is worth highlighting some of the division's accomplishments:

-- Unlike the shops divisions, the Custodial Division has manuals for both supervisors and employees, plus a separate training manual.

-- The division publishes a regular newsletter.

-- The division conducts surveys to assess customer service, and it regularly evaluates the work of employees in written form.

-- The division has reduced supply costs by having the University make and develop its cleaning chemicals. By the division's estimate, this reduces annual supply costs by $300,000 to $500,000.

C. CONCLUSIONS AND RECOMMENDATIONS

Judging by end results, we found no indications of serious problems in the University of Minnesota's custodial work. Although Physical Plant needs to refine its written service levels, the areas of the University we observed were quite clean. And despite some need for better training and communication with workers, we found no apparent problems with custodial methods and practices.

Still, there is room for improvements that could affect worker productivity and satisfaction. We recommend:

- Custodial supervisors should address possible work imbalances among custodians by developing site-specific service levels, where appropriate, and time standards for all tasks.

- Physical Plant should give all employees written descriptions of expected service levels and appropriate practices.

- Physical Plant should consider (1) the purchase of more back-up equipment, or more expedient means of delivering existing back-up equipment to appropriate locations, and (2) the cost-effectiveness of a formal preventive maintenance program for custodial equipment.

- Physical Plant should develop and fund better training programs for custodians, especially supervisors.

As noted in Chapter 3, our survey of custodians revealed that problems with direct supervisors were the greatest cause for employee dissatisfaction.

- Physical Plant should re-evaluate the merits of its deep cleaning crew. If, in fact, Physical Plant wishes to continue this sort of cleaning, it should consider (1) increasing the size of the current deep cleaning crew, (2) incorporating deep cleaning tasks into the workload of regular custodial crews, or (3) charging departments for this service.

Expanding the deep cleaning crew's staffing may be wise, considering the apparent satisfaction of customers with this service. In making staffing decisions, however, Physical Plant should also consider the effect of the deep cleaning crew on the morale of regular custodial staff. This crew often has a detrimental effect on the morale of regular work crews in the buildings scheduled for deep cleaning. The regular crews sometimes interpret the use of deep cleaning crews as a criticism of their performance. This may be an argument for increasing the service levels of regular crews.

As to overall custodial staffing, we found that Physical Plant has an average number of square feet per custodian, compared to other Big Ten schools. However, the University of Minnesota, unlike some other schools, has a large health sciences complex that requires more intensive cleaning. Thus, rather than judging Minnesota's staffing based on comparisons of square feet per custodian, we think it makes sense for Physical Plant to more closely scrutinize its levels of service and the staffing levels required to meet them. We recommend that:

- Physical Plant should develop a better inventory of its custodial cleaning tasks and more fully document expected service levels. This will provide a basis for more informed staffing decisions.

Finally, comparisons of Big 10 grounds maintenance staffing show that Minnesota has fewer staff than comparable institutions. A recent fund authorization by the Vice President for Finance and Physical Planning might address some of this deficiency, but the University's Landscape Technical Advisory Committee has not yet approved the expenditure. We also think that Physical Plant needs a more active role in the University's Landscape Technical Advisory Committee. We recommend that:

- As a first step, the Landscape Technical Advisory Committee should act on the Physical Plant grounds funding authorized by the Vice President earlier this year. Also, the University should make either Physical Plant's director of the Custodial and Grounds Division or its director of grounds services a member of the Landscape Technical Advisory Committee, and the committee should solicit more Physical Plant advice on possible improvements in campus grounds.

Currently, Physical Plant's director is the only Physical Plant representative on the Landscape Technical Advisory Committee, and he has not attended recent meetings.

FOOTNOTES

[1]Institute of Building Maintenance Technology, Bloomington, Minnesota.

[2]Association of Physical Plant Administrators of Universities and Colleges, *Comparative Cost and Staffing Report for 1984-85.*

[3]William S. Gardiner, "Formula Budgeting as a Technique," *Facilities Management: A Manual for Plant Administration.* ed. Teresa Burnau Evans, 1984.

[4]Kirk Campbell, "Custodial Services," *Facilities Management* (ibid.).

[5]The University also established a Landscape Technical Advisory Committee to the Environmental Advisory Committee.

[6]Letter from President Kenneth H. Keller to members of the Environmental Advisory Committee, September 10, 1986.

[7]Memo from David Lilly to William Thomas, March 31, 1988. The letter was also sent to members of the Landscape Technical Advisory Committee.

[8]The service levels call for windows to be cleaned once every three years.

[9]DCA Stanton Group, *1987 Twin Cities Metropolitan Area Salary Survey.* June 1987.

RELATED ISSUES

Chapter 6

In this chapter, we discuss three additional Physical Plant activities: (1) the Used Equipment Purchase Program, (2) the assignment of two individuals to the used equipment program and Transportation Services Division, and (3) remodeling of building space.

A. THE USED EQUIPMENT PURCHASE PROGRAM

Physical Plant Operation's Used Equipment Purchase Program was an attempt to save money by purchasing used transportation equipment in lieu of buying or leasing new items. We asked:

- Was the used equipment program well-managed?
- Did the program provide useful equipment at reduced cost?
- How has Physical Plant dealt with criticisms of the program, such as those contained in an internal University audit?

Our review consisted of interviews with the two individuals who bought and transported the equipment, the supervisors of the Delivery Services and Vehicle Maintenance sections of the Transportation Services Division, the heads of the Transportation Services, Heating Plant, and Custodial and Grounds Divisions, and other staff to whom the used equipment was intended or assigned. We also updated information from a 1987 audit of the program conducted by the University's internal auditors to determine the extent of recent repair expenditures and the current status of the equipment purchased. Finally, we reviewed four recent purchases to determine whether any changes have been implemented in the program as a result of the audit.

In general, our findings confirmed those of the University's internal audit. The program was poorly planned and has not yet produced cost savings.

1. Background

Physical Plant began its Used Equipment Purchase Program in February 1987. Its general objective was to save money by buying used equipment in lieu of purchasing or leasing new items. Some of the purchases also implied changes in Physical Plant operations. For

example, Physical Plant purchased used conveyor belts not to replace existing ones, but to encourage new methods of handling coal in the University's heating plants.

The program had two employees. Mr. Matt Jaren, a senior accountant, was responsible for working with Physical Plant division heads to determine equipment needs and for locating equipment to meet those needs. He reported to the Director of Physical Plant. Mr. William Miller, a University crane operator, was responsible for evaluating the condition of the equipment and transporting purchased items to the University. He reported to Mr. Jaren.

In response to allegations from Physical Plant employees and newspaper accounts of poor management, the University completed an internal audit of the program in January 1988. The audit found that the amount paid for 33 pieces of used equipment (including transportation and reconditioning) exceeded their fair market value and that Physical Plant staff purchased items without adequate planning for their use. The audit concluded that there was a lack of communication and coordination between Physical Plant's operating units and the people running the used equipment program.[1]

The University audit points out that the program's expenditures should be offset to some extent by the proceeds from sales of equipment replaced by the used equipment. The ultimate cost-effectiveness of the used equipment program would have to consider what it would cost to buy the same equipment new and under warranty. The University audit did not perform this analysis.

Used equipment purchases have recently resumed on a smaller scale. The University's audit covered a period (February 16 through December 15, 1987) when 33 items were purchased. Since then, four additional used vehicles have been purchased.

2. Update on Equipment Costs

The University audit found that, through December 15, 1987, Physical Plant spent $336,650 purchasing the 33 items. Through that date, Physical Plant also spent $35,757 to deliver the equipment (including travel expenses, fuel, and on-the-road repairs) and $42,352 refurbishing and repairing the equipment after its arrival.

Many of the items arrived in poor condition and Physical Plant mechanics have spent many hours repairing them. We reviewed journal vouchers and daily job reports and found that:

- Physical Plant spent an additional $46,306 to repair, refurbish, and maintain the vehicles (excluding fuel expense) since the University audit through June 1988, for a total vehicle repair cost of $88,658.

3. Program Assessment

As a result of the University audit, Physical Plant temporarily halted the used equipment program. However, Physical Plant management continued to describe the used equipment program to the Board of Regents as a well-conceived, successful program. In a January 1988 letter to the Regents Physical Planning and Operations Committee, the Associate Provost for Physical Plant said that charges "that there was insufficient planning and poor control of this phase of the program are not true."[2] The Associate Provost said that he and Physical Plant's director adequately monitored all purchasing activity.

Despite management's contention that the program was well-planned, our interviews confirmed the findings of the University audit that:

- Division heads or others were not properly consulted about purchases as to whether there was a need for a piece of equipment, or whether the specific item met the required specifications. In some cases, items were purchased after the division head expressly rejected the idea.

For example, the head of the Custodial and Grounds Division reports that he specifically rejected the idea of purchasing an Allis-Chalmers tractor but that Mr. Jaren purchased it anyway. He told Mr. Jaren that the grounds unit could use three pick-up trucks but Mr. Jaren purchased five. He was never consulted about two Texas utility trucks that Mr. Jaren purchased to use as mobile repair vehicles.

The best example of equipment purchases without consulting the division head are coal trailers and conveyors for use in the heating plants. When the Heating Plant Division head reviewed the equipment after purchase, he determined that the purchased coal trailers had less capacity than the existing trailers and were not designed to operate efficiently at the heating plant. Similarly, he found that the conveyors would not increase the efficiency of the coal handling operation. They are also in need of repair. The coal handling equipment has been idle since its purchase.

Because the program purchased equipment without consulting division heads in advance or following their recommendations when they were consulted, many of the items are not now being used. The University audit found that 14 of the 33 items purchased by the used equipment program were being used and 19 were not. We reviewed the status of the used equipment as of July 1988. We found that:

- The 14 items in use at the time of the University audit are still in use, but five of the items are being used infrequently or for purposes for which they were not originally intended.

For example, a 1978 Peterbilt tractor, a 1982 Fruehof Lo-Boy trailer, and a Transcraft flatbed trailer were originally purchased to haul other used equipment to the University. Over $25,000 of repairs have been made, but with the curtailment of the used equipment program the vehicles are rarely used.

We also found that:

- Of the 19 units idle at the time of the University audit, five are now in service although only two are being used as intended.

For example, two Ford utility trucks with winches were supposed to be mobile repair trucks but are only used in the vehicle maintenance yard.

The purchase of equipment without adequate consultation engendered resentment on the part of division heads and staff who felt imposed upon by two individuals lacking first hand knowledge of operations. Mr. Jaren and Mr. Miller claim that the equipment they purchased is useful but that mechanics failed to repair the equipment in a timely manner and division heads refused to consider its use. Mr. Jaren even suggests that division staff have sabotaged the used equipment.

Whatever the facts of the situation, it is clear that a cooperative relationship never existed between the purchasers and users of the equipment. Rather than assisting other employees with securing equipment to do their jobs more efficiently and effectively, Mr. Jaren and Mr. Miller found their ideas resisted by division heads and equipment users. Under this scenario, resentment and distrust is not surprising.

In our opinion, not all the items purchased in the used equipment program were ill-conceived. Some of the pick-up trucks are described by their users as good vehicles and cost-effective purchases. A hydrahammer used to break concrete and drive posts into the ground is another example of a piece of equipment that filled a need and is used as intended. However, these are exceptions to a general pattern of poorly planned purchases.

We also found that:

- The University does not have stringent budgetary controls for used equipment purchases.

The University requires that requisitions for new equipment over $2,000 be submitted for bids from vendors. Used equipment purchases, however, are not subject to this requirement. Instead, the University's Purchasing Department reviews requisitions to see if the prices being paid are reasonable. However, it does not review the condition of the vehicles and it is difficult to find comparable prices for many used vehicles, especially heavy equipment or vehicles that are very old. They also do not consider the cost of transporting equipment purchased out-of-state.

The overall cost-effectiveness of the used equipment program remains a matter of dispute. In January 1988, the Associate Provost for Physical Plant presented the Regents with a chart showing payback periods on various used vehicles (i.e., the purchase price compared to the leasing cost). However, he presented the Regents with information on the cost-effectiveness of the used equipment program that some people considered misleading because it neglected significant costs associated with vehicle ownership. According to the Associate Provost for Support Services and Operations, nearly half of the annual vehicle leasing costs paid by Physical Plant are for fuel, maintenance, insurance, licenses, and administrative overhead.[3] The information presented to the Regents did not include these costs. When these costs are considered, Physical Plant receives no positive payback from the used equipment for at least five years. In addition, the high mileage on many of the vehicles purchased in the used equipment program will probably cause them to have higher maintenance costs in the coming years.

In his presentation to the Regents, the Associate Provost also noted the program's two phases. The first, the purchase of equipment, ended in September 1987. The second was to end in June 1988 after replacing other equipment with the purchased used equipment. Leases for existing vehicles would be terminated and other replaced vehicles would be sold. The Associate Provost told the Regents that the second phase would result in "very tidy monetary savings."[4] However, through the end of June 1988, Physical Plant had returned only four leased vehicles to the University's Vehicle Fleet Services. The annual savings from the four vehicles is $9,300 in monthly charges and $3,365 in mileage charges. This savings is reduced by fuel, maintenance, insurance, and other administrative expenses that Physical Plant will now have to pay. Physical Plant's Custodial and Grounds Division also sold eight vehicles in November 1987 for $22,000, although not necessarily as a result of receiving replacement vehicles from the used equipment program. In our view, therefore:

- Physical Plant's vehicle sales and lease terminations during the second phase of its used equipment program have not significantly offset the purchase costs of the used equipment.

Have Physical Plant managers learned from the experience of this program? We reviewed four purchases of used equipment since the University audit was completed. Two are pick-up trucks that Physical Plant purchased from Vehicle Fleet Services (for $5,200 and $7,700). Physical Plant had been leasing one of the vehicles and the other was purchased with the intent of returning a leased vehicle to Vehicle Fleet Services. Physical Plant purchased the other two from the Minnesota Department of Natural Resources. One, a pick-up with 129,000 miles, was purchased for $1,350. It is currently in the repair shop and may need a new engine. The other, a small garbage truck, was purchased for $800 and is assigned to the Solid Waste Section of the Environmental Services Division. The supervisor of that section was consulted in advance about the availability of a used vehicle and is pleased that he received a useful vehicle for a low price.

Mr. Jaren and Mr. Miller have not made any out-of-state trips to auctions since the University audit, and Mr. Jaren has discussed proposed purchases with relevant staff prior to purchase. However, Mr. Jaren recently attempted to purchase two amphibious vehicles (vehicles that can be driven in land or water) for the Custodial and Grounds Division despite the fact that the division head said the vehicles did not suit the division's needs. The head of the Transportation Services Division disapproved the purchase. However, when the Transportation Services Division head was on vacation, Mr. Jaren went directly to the Associate Provost for Physical Plant for approval of the purchases. The Associate Provost referred the matter back to the division head, who again disapproved the purchase. We conclude, therefore, that:

- Physical Plant has made greater efforts to involve equipment users in purchase decisions and has not recently embarked on out-of-state purchasing trips. In addition, by placing Mr. Jaren under the supervision of the head of the Transportation Services Division, Physical Plant has provided greater control over used equipment purchases.

4. Recommendations

Based on our review of Physical Plant's used equipment purchase program, we recommend that:

- Funds for future used equipment purchases should come from the budgets of those units that will use the equipment and purchases should be made only after consultation with and approval from the appropriate division head.

- No purchases should be made without the approval of the head of the Transportation Services Division.

- Out-of-state purchases should only be considered after potential in-state sources of equipment have been exhausted.

- Used equipment should be thoroughly evaluated by a certified mechanic before purchase.

B. SPECIAL PERSONNEL ISSUES

When the Legislative Audit Commission directed us to audit and evaluate Physical Plant, we were asked to investigate allegations that a member of the Minnesota Senate had tried to influence individual personnel decisions within the Physical Plant. Our response was that we had neither the jurisdiction nor the independence to investigate a Minnesota Senator and suggested that the allegation should be taken before the Senate Ethics Committee. We did, however, agree to review the University's handling of the two employees mentioned in the allegations, Mr. Matt Jaren and Mr. William Miller.

University officials acknowledge that they had contact with a member of the Minnesota Senate concerning Mr. Miller and Mr. Jaren. The assert, however, that the contact had no bearing on their judgements or decisions concerning the two individuals. Nevertheless, we have questions about decisions Physical Plant management made concerning Mr. Miller and Mr. Jaren.

Mr. Jaren worked for the St. Paul Grounds Division until it was transferred to Physical Plant. Since Mr. Jaren had previous experience with buying used equipment, the Associate Provost for Physical Plant (Mr. Thomas) subsequently assigned him to the used equipment program discussed in the previous section. He was given his current duties when the Transportation Services Division was formed in January 1988.

We question the use of a senior accountant to perform vehicle maintenance and procurement duties. The position description for a senior accountant gives examples of regular on-going tasks which include budgeting, recordkeeping, and reviewing purchases for compliance with University policies. Departments have flexibility in determining the specific duties of a position, but the duties should be related to the examples in the position description. Although Mr. Jaren may be qualified to perform his duties, we believe he is misclassified. Normally, the Personnel Department challenges classifications and reviews employees' qualifictions. However, as discussed in Chapter 2, the Personnel Department's ability to make an objective determination could be compromised because it is under the direction of the Associate Provost for Physical Plant.

Mr. Miller has worked for the University as a heavy equipment operator (formerly called a crane operator) since 1977. He was chosen by Mr. Thomas to participate in the used equipment program because of his technical background. His performance impressed Mr. Thomas, and he was appointed to an executive assistant position on a temporary basis in November 1987. The appointment was scheduled to end April 25, 1988, but has continued at the request of Mr. Thomas.

The position description for an Executive Assistant requires a bachelor's degree in business administration or a combination of education and relevant administrative experience totalling five years. Mr. Miller does not meet these requirements, although he may hold the position of Executive Assistant on a temporary basis without meeting the requirements. Normally, temporary assignments are for six months, but may be extended with the approval of the Personnel Department. Extensions are permitted when assignments cannot be completed within the six-month period. Mr. Miller received an extension in April 1988, and the Associate Provost told us that Mr. Miller will be returning to his heavy equipment operator position in the near future.

C. REMODELING

"Remodeling" is the physical alteration of building space, in contrast to the repair and maintenance of existing building space. Most remodeling projects are larger in scope than maintenance projects, and most require engineering and architectural services.

Prior to late 1987, Physical Plant workers did about nine percent of the University's remodeling. In 1987, however, Physical Plant management believed that its remodeling services were not efficient, mainly because it was not uncommon for Physical Plant workers to be called away from remodeling projects to work on other tasks. Physical Plant management proposed creation of a special Construction Unit whose workers would do nothing but remodeling. Physical Plant wanted this unit to operate like a private contractor by bidding on projects and being held to its bid. However, in late 1987 Physical Plant management was unable to persuade the Vice President for Finance and Operations that its preferred model of project management for its remodeling projects was appropriate. Specifically, Physical Plant wanted to oversee its own remodeling projects, thus limiting an oversight role played by the University's Office of Physical Planning. Following the rejection of this idea by the Vice President, Physical Plant suspended the Construction Unit and decided not to do further remodeling. The loss of remodeling work reduced Physical Plant trade staffing by about 15.

Although Physical Plant has done a few small remodeling jobs in 1988, we found that:

- The University of Minnesota's Physical Plant appears to do less remodeling than any other Big 10 university.

Shops at the other Big 10 schools do small remodeling projects, usually no larger than $50,000 (the shops at Illinois and Michigan sometimes do projects up to $500,000).

In June 1988, officials from both Physical Plant and Physical Planning developed proposals to re-involve Physical Plant in remodeling work. Physical Plant management wanted to bid on projects up to $100,000, and Physical Planning proposed having Physical Plant bid on projects up to $50,000. In both proposals, the customer would choose whether to have Physical Plant or a private contractor provide the work, although Physical Planning would like to advise the customer in this decision. In addition, Physical Plant proposed having authority to subcontract projects under $100,000 for which customers selected private contractors. Currently, Physical Planning subcontracts this work.

We think that Physical Plant management has made a plausible case that it cannot compete with private contractors for remodeling unless it organizes a separate Construction Unit to do this work. For optimum efficiency, workers doing remodeling projects should not be called away frequently to do other tasks. In addition, despite the requirement that private bidders on remodeling projects pay the same wages Physical Plant does, a 1987 analysis by the Office of Physical Planning showed that Physical Plant consistently submitted higher bids than private contractors or the University's engineering estimates of appropriate costs.[5] While some Physical Plant workers question the efficiency of having a Construction Unit totally separate from the other shops, Physical Plant management has made an equally compelling argument for a separate unit. However, we do not think that Physical Plant has made a convincing case for limiting Physical Planning's oversight role in remodeling work done by Physical Plant. The Associate Provost for

Physical Plant has argued that Physical Planning's oversight of Physical Plant remodeling is unnecesary because ". . . if Physical Plant can be trusted by the Board of Regents and the Administration to administer multi-million dollar maintenance projects without being overseen by the Planning Department, I see no logic to our having to be checked on while performing minor remodeling projects ...."[6]

Our reasons for questioning Physical Plant's stance are fourfold. First, if Physical Plant wants its Construction Unit to operate like a private contractor, then it should be subject to the same quality checks that private contractors are. Second, Physical Planning staff told us that Physical Plant often made unauthorized changes in the scope of work when it did remodeling projects. Closer oversight by Physical Planning might guard against this. Third, if Physical Plant management believes (as it told us) that quality of work is the main basis on which it can compete with private contractors, then an objective third party should carefully evaluate Physical Plant's work quality and have authority to act if quality is inadequate. Fourth, although Physical Plant does manage large maintenance projects itself, most of these do not alter the character of buildings. Oversight of remodeling requires technical knowledge of design and architecture that Physical Planning staff already have.

Overall, we applaud Physical Plant for proposing a Construction Unit that will organize its work more efficiently and market its strengths to customers. However, we are concerned that Physical Plant's role as a service contractor could hinder its ability to oversee projects objectively.

We also think that before Physical Plant can compare its costs to the bids of private contractors, it needs to improve its cost accounting. As discussed in Chapter 2, Physical Plant should more accurately reflect overhead costs in its estimates.

FOOTNOTES

[1]University of Minnesota, Department of Audits, "A Financial Review of the Physical Plant Used Equipment Program," January 1988.

[2]Letter from William Thomas to the Regents Physical Planning and Operations Committee, January 29, 1988.

[3]Memo from Neil Bakkenist to William Thomas, "Used Equipment Analysis," February 16, 1988.

[4]Letter from Thomas to Regents committee, January 29, 1988.

[5]Memorandum from Otis Anderson to David Lilly, "Remodeling Projects and Analysis," October 22, 1987.

[6]Memorandum from William Thomas to Carol Campbell, Ed Foster, and Clint Hewitt, "Remodeling Revisited," June 6, 1988.

APPENDIX A

RESULTS OF PHYSICAL PLANT EMPLOYEE SURVEY

This appendix reports results from our survey of Physical Plant employees. We surveyed 211 shop workers and 184 custodians, about half the total number of full-time workers in these positions. The Minnesota Survey Research Center administered the survey in 12 group settings to employees on May 25 and 26, 1988. There were separate surveys for the shop and custodial workers, although they contained 35 identical questions. The surveys also asked several questions specific to the shop or custodial workers. The first 20 questions of the survey are from a standardized job satisfaction survey, the Minnesota Satisfaction Questionnaire. A copy of the shop survey follows this summary of the responses. Responses of "neither satisfied nor dissatisfied," "not sure," and "does not apply" are not shown.

	CUSTODIANS		SHOP WORKERS	
	Percent Satisfied	Percent Dissatisfied	Percent Satisfied	Percent Dissatisfied
1. Being able to keep busy all the time	82	6	86	8
2. The chance to work alone on the job	82	7	87	3
3. The chance to do different things from time to time	74	11	89	5
4. The chance to be "somebody" in the community	45	20	40	15
5. The way my boss handles his or her workers	51	32	56	28
6. The competence of my supervisor in making decisions	58	28	50	33
7. Being able to do things that don't go against my conscience	71	10	71	8
8. The way my job provides for steady employment	93	3	91	4

	CUSTODIANS		SHOP WORKERS	
	Percent Satisfied	Percent Dissatisfied	Percent Satisfied	Percent Dissatisfied
9. The chance to do things for other people	66	8	83	2
10. The chance to tell people what to do	31	13	40	4
11. The chance to do something that makes use of my abilities	57	22	79	11
12. The way Physical Plant policies are put into practice	36	37	15	65
13. My pay and the amount of work I do	70	15	71	13
14. The chances for advancement in my job	39	40	39	26
15. The freedom to use my own judgement	68	19	68	16
16. The chance to try my own methods of doing the job	74	15	74	11
17. The working conditions	70	17	59	23
18. The way my co-workers get along with one another	57	22	74	13
19. The praise I get for doing a good job	48	29	37	29
20. The feeling of accomplishment I get from the job	63	15	74	11

	CUSTODIANS		SHOP WORKERS	
	Sometimes, rarely, or never	Often, usually, or always	Sometimes, rarely, or never	Often usually, or always
21. My direct supervisors make their expectations clear to me	36	62	42	56
22. I'm proud of my daily work	19	77	12	85
23. Physical Plant's director communicates effectively with employees	53	19	83	4
24. I'm proud to work for the University	24	70	29	69
25. Like a good team, people at Physical Plant work together for the same goals	46	47	45	53
26. I'm proud to work for Physical Plant	37	54	28	69
27. My direct supervisors care about me	42	49	35	60
28. The quality of work done by Physical Plant employees is as good as that done by private contractors	16	76	4	95
29. I look forward to coming to work	42	56	25	73
30. My direct supervisors keep me informed about the quality of my work	40	58	55	45
31. My workplace and working conditions are safe	20	72	37	62
32. The director of Physical Plant does a good job	34	38	71	10

	CUSTODIANS		SHOP WORKERS	
	Sometimes, rarely, or never	Often, usually, or always	Sometimes, rarely, or never	Often usually, or always
33. When I have concerns about work safety, I know who to talk to	21	75	28	69
34. My schedule and workload are reasonable	27	70	17	82
35. When I express concerns about my job, my superiors try to address these concerns	40	54	41	57
36. I have proper equipment and supplies to do my job	24	72	--	--
37. My direct supervisor's boss does a good job	35	52	--	--
38. My uniforms fit well and are comfortable to work in	54	40	--	--
39. My work schedule is well-coordinated with those of other Physical Plant workers	28	57	--	--

Other findings:

In Chapter 3, we report survey results on the percentage of employees that think Physical Plant is becoming a more or less satisfying place to work. We also report the things that Physical Plant employees like best about their work. Table 4.2 shows the extent to which shop workers report having problems with waiting or work assignments.

Shop workers also reported the following: 5 percent said that after working on a shop ticket, they usually go back to the shop to get a new assignment; 10 percent said they usually call the shop to get an assignment; 42 percent said they usually go straight to their next job, which has already been assigned; 41 percent said assignment practices vary from job to job.

On average, shop workers reported that they spend 47 minutes a week waiting for assignments, 115 hours a week waiting for rides, 65 minutes a week riding in vehicles, and 63 minutes a week waiting for tools.

When given a chance to express general comments or areas in which Physical Plant needs changes, the most common topics noted by custodians were (in order): (1) problems with supervision, (2) problems with uniforms, (3) the need for better equipment and faster repairs, (4) the need for more staff, especially to fill in for absent workers, (5) the need to adjust workloads, and (tie) the need for better communication with management.

The most common topics noted by shop workers were (in order): (1) concerns about area managers, and (tie) concerns about Physical Plant's top management, especially Mr. Thomas and Mr. Bailey, (3) problems with the transportation system, (4) the use of private contractors for work that Physical Plant could do, and (5) concerns about the adequacy of equipment and supplies.

PHYSICAL PLANT EMPLOYEE SURVEY

PART A

*Ask yourself: How **satisfied** am I with this aspect of my job? Mark (X) the most appropriate answer.*

***Very Sat.** means I am very satisfied with this aspect of my job.*

***Sat.** means I am satisfied with this aspect of my job.*

***Dissat.** means I am dissatisfied with this aspect of my job.*

***Very Dissat.** means I am very dissatisfied with this aspect of my job.*

***Neither Sat. nor Dissat.** means I can't decide whether I am satisfied or not with this aspect of my job.*

On my present job, this is how I feel about . . .

		Very Dissat.	Dissat.	Neither Sat. nor Dissat.	Sat.	Very Sat.
1.	Being able to keep busy all the time	—	—	—	—	—
2.	The chance to work alone on the job	—	—	—	—	—
3.	The chance to do different things from time to time	—	—	—	—	—
4.	The chance to be "somebody" in the community	—	—	—	—	—
5.	The way my boss handles his/her workers	—	—	—	—	—
6.	The competence of my supervisor in making decisions	—	—	—	—	—
7.	Being able to do things that don't go against my conscience	—	—	—	—	—
8.	The way my job provides for steady employment	—	—	—	—	—
9.	The chance to do things for other people	—	—	—	—	—
10.	The chance to tell people what to do	—	—	—	—	—
11.	The chance to do something that makes use of my abilities	—	—	—	—	—
12.	The way Physical Plant policies are put into practice	—	—	—	—	—
13.	My pay and the amount of work I do	—	—	—	—	—
14.	The chances for advancement on this job	—	—	—	—	—
15.	The freedom to use my own judgment	—	—	—	—	—
16.	The chance to try my own methods of doing the job	—	—	—	—	—
17.	The working conditions	—	—	—	—	—
18.	The way my co-workers get along with each other	—	—	—	—	—
19.	The praise I get for doing a good job	—	—	—	—	—
20.	The feeling of accomplishment I get from the job	—	—	—	—	—

Very Dissat. Dissat. Neither Sat. nor Dissat. Sat. Very Sat.

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37. The things I like **BEST** about working for Physical Plant are:

(CHOOSE UP TO THREE)

__ (a) The work is steady;
__ (b) The pay is good;
__ (c) The quality of my unit's work is good;
__ (d) This is a well-managed organization;
__ (e) There are new challenges every day;
__ (f) I feel good maintaining an important place like the university;
__ (g) I like the people I work with;
__ (h) Other: (please specify) _____
__ (i) Not sure.

38. After completing work on a shop ticket:

__ (a) I usually go back to the shop to get a new assignment.
__ (b) I usually call the shop to get a new assignment.
__ (c) I usually go straight to the next job, which has already been assigned.
__ (d) The way I get my next assignment varies from job to job.

As you know, not every job goes as smoothly as possible. Sometimes there are problems or delays that prevent workers from doing a job in the quickest and best way. From your experience at Physical Plant, how often do the following kinds of problems occur?

		Rarely or never happens	Sometimes happens	Often happens	Usually or always happens	Doesn't apply or not sure
39.	I am assigned shop tickets that do not clearly indicate the job to be done.	__	__	__	__	__
40.	I have to wait too long to get work assignments.	__	__	__	__	__
41.	Jobs are assigned to the wrong shop.	__	__	__	__	__
42.	I have to wait too long to get rides from the Transportation Division.	__	__	__	__	__
43.	I have to wait too long to get the proper tools, equipment, or materials.	__	__	__	__	__

(PLEASE BE AS SPECIFIC AS POSSIBLE) During a typical 40-hour week, this is the total amount of time I spend in each of the following activities:

44. Waiting for assignments ____ hour(s) and ____ minutes

45. Waiting for rides from the Transportation Division ____ hour(s) and ____ minutes

46. Riding in Transportation Division vehicles ____ hour(s) and ____ minutes

47. Waiting for equipment, tools, or materials that I need to do a job ____ hour(s) and ____ minutes

48. During a typical week, the number of rides I get from the Transportation Division is: _____ rides

PART B

For each statement, check the answer that best describes your views:

		Rarely or Never	Sometimes	Often	Usually or Always	Doesn't apply or not sure
21.	My direct supervisors make their expectations clear to me.	—	—	—	—	—
22.	I'm proud of my daily work.	—	—	—	—	—
23.	Physical Plant's director (Mr. Bailey) communicates effectively with employees.	—	—	—	—	—
24.	I'm proud to work for the university.	—	—	—	—	—
25.	Like a good team, people at Physical Plant work together for the same goals.	—	—	—	—	—
26.	I'm proud to work for Physical Plant.	—	—	—	—	—
27.	My direct supervisors care about me.	—	—	—	—	—
28.	The quality of work done by Physical Plant employees is as good as that done by private contractors.	—	—	—	—	—
29.	I look forward to coming to work.	—	—	—	—	—
30.	My direct supervisors keep me informed about the quality of my work.	—	—	—	—	—
31.	My workplace and working conditions are safe.	—	—	—	—	—
32.	The director of Physical Plant does a good job.	—	—	—	—	—
33.	When I have concerns about work safety, I know who to talk to.	—	—	—	—	—
34.	My schedule and workload are reasonable.	—	—	—	—	—
35.	When I express concerns about my job, my superiors try to address these concerns.	—	—	—	—	—

PART C

Please answer the questions in this part of the survey by marking the appropriate blanks and providing written answers.

36. Physical Plant is:

___ (a) Becoming a more satisfying place to work.
___ (b) About as satisfying as it has always been.
___ (c) Becoming a less satisfying place to work.
___ (d) Not sure.

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49. If I could make two changes at Physical Plant, I would:

a. _____

_____

b. _____

_____

50. Additional comments or suggestions you would like to make about your job:

51. Name of my shop: _____

52. I have been in my current line of work for _____ years.

53. I work at the
___ (a) Health Sciences complex
___ (b) St. Paul campus
___ (c) Minneapolis campus.

54. My age is:
___ (a) 18 to 25
___ (b) 26 to 35
___ (c) 36 to 45
___ (d) 46 to 55
___ (e) 56 to 65
___ (f) Over 65

THANK YOU FOR YOUR COOPERATION. ALTHOUGH YOU DO NOT NEED TO PUT YOUR NAME ON THIS SURVEY, WE DO ASK THAT YOU SIGN YOUR NAME TO THE LIST OF SURVEY PARTICIPANTS BEFORE LEAVING.

APPENDIX B

SAMPLES OF WORK REVIEWED BY TECHNICAL CONSULTANTS

We hired three consultants to help us address technical issues in this report. This section describes the samples of Physical Plant work examined by the consultants. Each of the consultants supplemented their review of work samples with staff interviews and reviews of relevant documents.

A. PREVENTIVE MAINTENANCE ON EQUIPMENT

The purpose of this consultant analysis was to determine (1) the strengths and weaknesses of the University's preventive maintenance system, (2) whether current preventive maintenance activities were scheduled at appropriate frequencies, and (3) whether the failure to do certain preventive maintenance activities put the University's equipment at serious risk.

For each Physical Plant shop, we calculated the percentage of total shop tickets closed in March 1988 that were for preventive maintenance. We then chose to limit our sample to the eight shops in which at least 19 percent of the tickets were for preventive maintenance. We obtained Physical Plant's preventive maintenance inventory that lists all 37,000 items subject to preventive maintenance. Then, for each of the eight shops, we selected every hundredth item from the inventory for inclusion in our sample. This provided a sample of 346 activities.

In addition, we selected a sample of the 210 preventive maintenance shop tickets that Physical Plant closed in March 1988 with no labor hours charged (that is, they were not done). We made a random selection of 144 of these tickets.

Finally, the consultant selected a sub-sample of 50 items for on-site inspections. We asked our consultant to select 40 from the 346-item sample and 10 from the 144-item sample. The primary basis for the consultant's sub-sample selection was the frequency with which items appeared in the larger samples. In addition, the consultant selected some items that had vague descriptions in the inventory, thus necessitating on-site observation to determine whether the maintenance schedules were appropriate. Also, the consultant selected a few items serviced by more than one shop using different maintenance frequencies.

B. SHOP REPAIR AND MAINTENANCE PROJECTS

The purpose of this review was to evaluate quality, timeliness, staffing practices, and planning and scheduling practices on a sample of maintenance and repair jobs completed by Physical Plant's shops.

Most of the jobs done by Physical Plant shops require less than four hours of labor. However, while larger projects account for a minority of shop tickets, they require a disproportionately large amount of the shops' time. For example, we found that in February 1988 Physical Plant spent about one-fourth of its time doing authorizations, or projects costing more than $2,500. This included some remodeling projects. Since the shops no longer do remodeling projects, their workload probably contains a larger proportion of small jobs.

We decided to select 40 call-in repair jobs and 10 authorizations for our consultant to review. Within the call-in jobs, we stratified our sample by size of ticket (in hours) so that the number of tickets of various sizes roughly reflected their actual frequency among tickets closed in March 1988. Thus, we randomly selected 25 tickets that took less than 4 hours, 13 tickets that took between 4 and 15 hours, and 2 tickets that took 16 or more hours. We limited our sample to the six shops that accounted for about 70 percent of call-in tickets in March 1988. We selected our random sample of 10 authorizations from among projects completed by Physical Plant staff in March 1988 that were not remodeling jobs. In some cases our consultant found that workers could not recall jobs worked on in March (or earlier) and eliminated these jobs from the sample.

C. CUSTODIAL OPERATIONS

The purpose of this analysis was to evaluate (1) whether the University's written levels of service are appropriate, (2) staffing practices, (3) the efficiency and effectiveness of work practices and methods, and (4) the use of specialized cleaning crews.

We asked our consultant to examine 12 work assignments at the University. To evaluate the University's "deep cleaning" operation, we designated this crew to be the subject of one of our consultant's reviews. To select the remaining 11 sites, we met with the head of Physical Plant's Custodial and Grounds Division and reviewed a list of buildings cleaned by custodial staff. Based on his comments, we developed categories of buildings (such as "office space only," or "classroom and lab space") and placed each University building with more than 50,000 square feet of space in a category. We then calculated the square feet of building space in each category to determine how many buildings of each type to select for our sample. For example, buildings with "office space only" comprised only about nine percent of total building space, so we designated one of our 11 sample work assignments for buildings of this type. Within each category of building, we randomly selected buildings. Finally, we obtained lists of employee work assignments in the selected buildings and randomly selected our final sample.